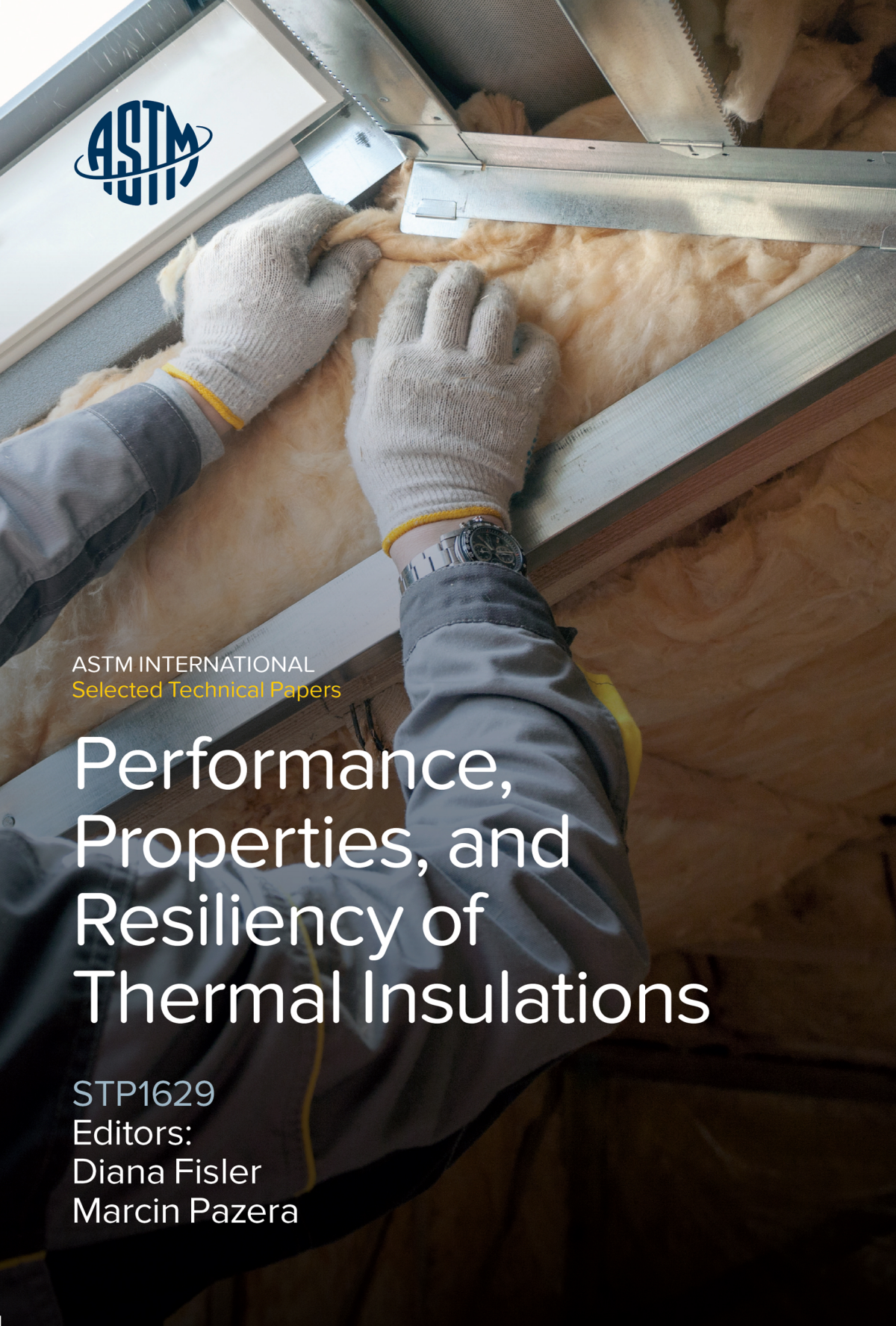

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Performance, Properties, and Resiliency of Thermal Insulations

STP1629

Editors:
Diana Fisler
Marcin Pazera

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Foreword

THIS COMPILATION OF Selected Technical Papers, STP1629, *Performance, Properties, and Resiliency of Thermal Insulations*, contains peer-reviewed papers that were presented at a symposium held virtually on June 16–17, 2021. The symposium 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 International 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. In the ensuing decades, the building construction industry has witnessed many social, economic, and technical challenges. However, during the last years, these changes have accelerated in an unprecedented way. More frequent and extreme weather events, increasing global temperatures, and, recently, a global pandemic, are stressing the ingenuity of the building industry and building professionals to respond. Through it all, a key feature of the response continues to be high quality research and collaboration focused on rigorous and verifiable data, guides, and standards.

Buildings still account for about 40% of national energy demand in developed nations. Both energy efficiency and sustainability of buildings and urban areas have moved beyond niche concerns to become key issues for national and international policymakers dealing with the impacts of climate change and mitigation strategies. These priorities have not changed, and Committee C16 continues to provide a forum for building professionals to share knowledge and develop best practices. What's new is the recognition that future materials will need to comply with increased demand on their resiliency in the face of extreme weather events and unusual events such as the recent global pandemic. We expect to see increasing focus on this need to spur innovation in thermal insulation materials and systems that can effectively manage heat, air and moisture, fire, and unexpected changes in building use. Thermal insulation materials not only play a key role in improving energy efficiency of built environments but also serve a critical role in protecting critical infrastructure. The built environment encompasses various applications from the building enclosure (such as wall, roofs, and insulated glazing) to mechanical equipment and systems (such as pipes). The concepts of resiliency and durability are critical when assessing the long-term performance of thermal insulation materials. The understanding of physical and chemical properties of thermal insulation materials, and performance of these materials in assemblies, have become fundamental concepts in designing more resilient, durable, and energy efficient buildings and systems. Successful implementation of building codes and integration of novel materials and technologies require a strategic approach toward research and development, with focus on the performance and durability of new materials and technologies, as well as well-designed standards to guide innovation with reduced risk.

This STP represents the peer-reviewed papers presented at the June 16–17, 2021, virtual symposium on *Performance, Properties, and Resiliency of Thermal Insulations*, sponsored by Committee C16 on Thermal Insulation. The symposium and this STP represent the continued efforts of the Committee to exchange state-of-the-art knowledge on topics related to performance of resiliency of thermal insulation materials in the built environment. The first section focuses on mechanical and pipe insulations, while the second section treats the building envelope and materials therein.

Most recent past symposia of this committee included:

- *Symposium on Advances in Hygrothermal Performance of Building Envelopes: Materials, Systems and Simulations*, Orlando, Florida (October 26–27, 2016)
- *Symposium on Next-Generation Thermal Insulation Challenges and Opportunities*, Jacksonville, Florida (October 23–24, 2013)
- *Second Symposium on Heat-Air-Moisture Transport: Measurements and Implications in Buildings*, Vancouver, British Columbia, Canada (April 19–20, 2009)
- *Heat-Air-Moisture Transport: Measurement on Building Materials*, Toronto, Ontario, Canada (April 23–26, 2006)
- *Fourth Symposium on Insulation Materials: Testing and Applications*, Charleston, South Carolina (October 21–22, 2002)

This symposium builds on previous research and expertise on thermal insulation performance within the broader building industry. Both moisture and air flow impact energy transfer as well as performance and durability of insulation materials. As in past symposia, the papers presented in this STP emphasize these concepts and add to the expanding knowledge base on the topic.

This symposium featured two distinguished keynotes highlighting the importance insulating materials will play in the coming decades. Mr. Chris Mathis of MC2 presented a forward-looking perspective on priorities for building performance. Mr. James E. Fesmire of Energy Solutions, LCC, highlighted key aspects of insulating materials under extreme environmental conditions. The keynote speakers highlighted the important role thermal insulating materials play today and will continue to do so into the future.

The editors would like to thank the Committee 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. Thanks to Mary Mikolajewski, Committee C16 Staff Manager; Kelly Dennison, Manager, Symposia Operations; Jennifer Buono,

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