

# 2022 Residential Building Design & Construction Conference

## Event Schedule

Wed, May 11, 2022

8:15 AM

### Transforming Buildings into Carbon Sinks

🕒 8:15 AM - 9:30 AM, May 11

**Keynote Session** **Opening Remarks**

Dr. Srubar's presentation will emphasize the AEC industry's vital obligation and opportunities to address the climate crisis. More specifically, he will illustrate the importance of understanding, quantifying, and reducing embodied carbon in construction. In addition to discussing the of structural building materials, including concrete and steel, his presentation will highlight the promise and potential of rapidly renewable carbon-sequestering biomaterials and demonstrate how simple design decisions can not only reduce embodied carbon in buildings but also transform buildings from carbon emitters into carbon sinks.

#### 🗣️ Speaker



**Wil V. Srubar, III**

Associate Professor  
University of Colorado Boulder

#### 1 Subsessions

##### ● Opening Remarks

🕒 8:15 AM - 8:30 AM, May 11

9:45 AM

### Virtual Networking Session 1

🕒 9:45 AM - 10:15 AM, May 11

10:30 AM

### Sessions A: Innovative & Affordable Housing

🕒 10:30 AM - 12:00 PM, May 11

**Affordable Housing** **Innovative Housing**

Moderator: Ryan Bradley

#### 🗣️ Speaker



**Ryan Bradley**

Senior Lecturer  
University of the Witwatersrand

3 Subsessions

● **High-performing technologies for contemporary residential Rural buildings in the Pianura Padana territory**

🕒 10:30 AM - 11:00 AM, May 11

● **Catenary domes for housing: benefits and challenges**

🕒 11:00 AM - 11:30 AM, May 11

● **The Use of Artificial Intelligence Techniques for Predicting Compressive Strength for High Performance Concrete: A Review**

🕒 11:30 AM - 12:00 PM, May 11

**Sessions A: Building Envelope**

🕒 10:30 AM - 12:00 PM, May 11

Building Enve...

Moderator: David O. Prevatt

🗣️ **Speaker**



**David Prevatt**

Professor  
University of Florida

3 Subsessions

● **Multi-chamber Standardized Testing of Air-permeable Cladding Materials**

🕒 10:30 AM - 11:00 AM, May 11

● **Performance of OSB and SFS Shear Walls in Residential Building**

🕒 11:00 AM - 11:30 AM, May 11

● **An Innovative, High-performance Shell Structure for Residential Construction: The SPS System**

🕒 11:30 AM - 12:00 PM, May 11

**Sessions A: Building Science Education**

🕒 10:30 AM - 12:00 PM, May 11

Building Science Edu...

Moderator: Georg Reichard

🗣️ **Speaker**



**Georg Reichard**

Professor  
Virginia Tech

2 Subsessions

● **Introductions, Overview, and Where Are We Now?**

🕒 10:30 AM - 11:30 AM, May 11

● **Beyond Boundaries: Education to Advance the Transformation of the Architecture, Engineering, Construction, and Operations Industry**

🕒 11:30 AM - 12:00 PM, May 11

12:00 PM

**Lunch Break**

🕒 12:00 PM - 12:30 PM, May 11

### Sessions B: Disaster Resilience

🕒 12:30 PM - 2:00 PM, May 11

Disaster Resilie...

Moderator: David O. Prevatt

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#### 🗣️ Speaker



**David Prevatt**  
Professor  
University of Florida

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#### 3 Subsessions

- **Observations and Analysis of wind pressures on roof overhangs and underneath walls of a low-rise building**  
🕒 12:30 PM - 1:00 PM, May 11
- **Analysis of Complex Flow Characteristics from Field and Simulated Hurricane Measurements**  
🕒 1:00 PM - 1:30 PM, May 11
- **Case Studies of Building Resilience in Hurricanes**  
🕒 1:30 PM - 2:00 PM, May 11

### Sessions B: Mechanical & Lighting

🕒 12:30 PM - 2:00 PM, May 11

Mechanical & Lig...

Moderator: Pat Huelman

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#### 🗣️ Speaker



**Pat Huelman**  
Associate Extension Professor  
University of Minnesota

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#### 3 Subsessions

- **Balance Points are Changing – and That’s Just Sensible!**  
🕒 12:30 PM - 1:00 PM, May 11
- **Development of Smart Watering Algorithm To Improve Biowall Performance**  
🕒 1:00 PM - 1:30 PM, May 11
- **Machine learning based surrogate model for faster daylighting estimation in building design**  
🕒 1:30 PM - 2:00 PM, May 11

### Sessions B: Mass Timber & CLT

🕒 12:30 PM - 2:00 PM, May 11

Mass Timber & ...

Moderator: Nathan Brown

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#### 🗣️ Speaker



**Nathan Brown**  
Assistant Professor  
Penn State

3 Subsessions

● **Parametric Evaluation of Embodied Carbon within Design for Hybrid Mass Timber Floor Systems**

🕒 12:30 PM - 1:00 PM, May 11

● **Structural Design of a Cross-Laminated Timber (CLT) Single-Family Home**

🕒 1:00 PM - 1:30 PM, May 11

● **Moisture Vapor Buffering and Latent Heat Effects of CLT Insulated with Wood Fiber Insulation Assembly on Energy Saving**

🕒 1:30 PM - 2:00 PM, May 11

**Sessions B: Building Science Education**

🕒 12:30 PM - 2:00 PM, May 11

**Building Science Edu...**

Moderator: Brian Wolfgang

🗣️ **Speaker**



**Brian Wolfgang**

Associate Director  
Pennsylvania Housing Research Center at Penn State

3 Subsessions

● **Resilience and Social Justice as a Framework for Architectural Education, Research and Practice – The Design+Build Kunga ADU**

🕒 12:30 PM - 1:00 PM, May 11

● **Facilitating Real-World Project-Based Service-Learning Opportunities by Participating in Department of Energy Race to Zero and Solar Decathlon Competitions**

🕒 1:00 PM - 1:30 PM, May 11

● **Continued Experiences with the Solar Decathlon Design Challenge**

🕒 1:30 PM - 2:00 PM, May 11

2:15 PM

**Poster Session A: 1-6**

🕒 2:15 PM - 2:30 PM, May 11

Under the Agenda, click on the "Posters" section to view 6 different posters. You are able to view and comment on the posters at any point. Presenters will be able for live dialogue during this time block with posters #1-6 available from 2:15-2:30pm.

2:30 PM

**Poster Session B: 7-10**

🕒 2:30 PM - 2:45 PM, May 11

Under the Agenda, click on the "Posters" section to view 4 different posters. You are able to view and comment on the posters at any point. Presenters will be able for live dialogue during this time block with posters #7-10 available from 2:30-2:45pm.

3:00 PM

**Sessions C: Innovative Housing; Affordable Housing**

🕒 3:00 PM - 4:30 PM, May 11

**Affordable Housing**

**Innovative Housing**

Moderator: Theresa Gilbride

Speaker



**Theresa Gilbride**

Energy-Efficiency Researcher  
Pacific Northwest National Laboratory

3 Subsessions

● **Frame House System: An Open-Source Housing Design and Construction System**

🕒 3:00 PM - 3:30 PM, May 11

● **How to Make Zero Energy Ready Pencil Out at the Production Scale**

🕒 3:30 PM - 4:00 PM, May 11

● **Discussion of Tiny Home Inclusion as a Concentric Diversification Strategy in Production Home Building to Address Housing Crisis**

🕒 4:00 PM - 4:30 PM, May 11

**Sessions C: Occupant Behavior**

🕒 3:00 PM - 4:30 PM, May 11

Occupant Beha...

Moderator: Mohsen Goodarzi

Speaker



**Mohsen Goodarzi**

Assistant Professor of Construction Management  
Ball State University

3 Subsessions

● **Case Study: The Effect of Homeowner Behavior on Energy-Efficiency in a High-Performance Home**

🕒 3:00 PM - 3:30 PM, May 11

● **Impact of Occupant Characteristics on the Energy Performance of Multifamily Residential Building in the United States**

🕒 3:30 PM - 4:00 PM, May 11

● **Development and validation of a post-occupancy evaluation model for LEED-certified residential projects**

🕒 4:00 PM - 4:30 PM, May 11

**Sessions C: Hemp**

🕒 3:00 PM - 4:30 PM, May 11

Hemp

Moderator: Hojae Yi

Speaker



**Hojae Yi**

Assistant Research Professor  
Penn State

### 3 Subsessions

#### ● Use of Industrial Hemp and Bamboo Fiber in Construction

🕒 3:00 PM - 3:30 PM, May 11

#### ● Critical Review of the Characterization of Environmental and Mechanical Properties of Hemp Hurd and Hempcrete

🕒 3:30 PM - 4:00 PM, May 11

#### ● Modeling of 3D printing Concrete based on Meshfree Explicit Galerkin Analysis Method

🕒 4:00 PM - 4:30 PM, May 11

### Sessions C: Building Science Education

🕒 3:00 PM - 4:30 PM, May 11

Building Science Edu...

Moderator: Georg Reichard

#### 🗣️ Speaker



**Georg Reichard**

Professor  
Virginia Tech

### 1 Subsessions

#### ● Picking Favorites - A Building Science Education Showcase/Showdown Panel

🕒 3:00 PM - 4:30 PM, May 11

**Thu, May 12, 2022**

8:15 AM

### Rural Studio: What Does Affordable, High-Performance Housing Truly Afford?

🕒 8:15 AM - 9:30 AM, May 12

Keynote Session

Opening Remarks

For almost 30 years, Auburn University's [Rural Studio](#) has engaged in research and real-world applications relating to rural prosperity in West Alabama, where approximately 30% of the population lives below the poverty line. Harnessing decades of knowledge, Rural Studio's "Front Porch Initiative" aims to develop a scalable, sustainable, equitable, and resilient delivery process for beautiful, well-designed, high-performance, affordable homes in underserved rural communities across the United States. Directly addressing the systemic issues underlying the housing affordability crisis in rural America, the project analyzes not only what a house costs to construct but also what it might afford a homeowner and family once occupied. By coupling 'first cost' inputs with the outcomes of the "total costs" of homeownership, the initiative is working to create a new paradigm for housing access and affordability. Focusing on the home's energy, resilience, and wellness performance, the project aims to replace the existing stock of substandard residences with safe, secure, healthy, and high-performing dwellings.

Working across the entire ecosystem of housing procurement, Rural Studio is aligned with an array of national and federal collaborators including: Fannie Mae, USDA, HUD, the Department of Energy, The Environmental Protection Agency, the National Institute of Building Sciences, the Insurance Institute for Building and Home Safety, the Healthy Building Network, the Housing Assistance Council, the Joint Center for Housing Studies of Harvard University, Wells Fargo, Regions Bank, and Habitat for Humanity International. Together this coalition of partners is investigating a holistic approach to housing affordability that addresses the systemic issues and financial impact of energy performance, building resilience, health and wellness outcomes, and local workforce development.

This keynote will present a contextual and comprehensive overview of the work of Rural Studio, along with an open discussion about the coalition's systems-wide approach to addressing the ongoing inventory, affordability, and homeownership crisis in Rural America.

🗣️ Speaker



**Rusty Smith**  
Associate Director  
Auburn University Rural Studio

1 Subsessions

- **Opening Remarks**  
🕒 8:15 AM - 8:30 AM, May 12

9:45 AM

**Virtual Networking Session 2**

🕒 9:45 AM - 10:15 AM, May 12

10:30 AM

**Sessions D: Innovative Housing**

🕒 10:30 AM - 12:00 PM, May 12

Innovative Hou...

Moderator: Carlo Carbone

🗣️ Speaker



**Carlo Carbone**  
Professor  
Université du Québec à Montréal

3 Subsessions

- **A Multi-manufacturer Platform Approach to Modular Volumetric Construction – An Experiment in Cross-pollinating Design with Fabrication**  
🕒 10:30 AM - 11:00 AM, May 12
- **Design Grammar of Scaffold-Free 3D Printed Shells**  
🕒 11:00 AM - 11:30 AM, May 12
- **Utilizing Artificial Intelligence for Designing Cement-Based Materials for 3D Concrete Printing Applications**  
🕒 11:30 AM - 12:00 PM, May 12

**Sessions D: Retrofits**

🕒 10:30 AM - 12:00 PM, May 12

Retrofits

Moderator: Philip Boudreaux

🗣️ Speaker



**Philip Boudreaux**  
R&D Associate  
Oak Ridge National Laboratory

3 Subsessions

● **Application of refractive fluid flow imaging techniques for visualizing building exfiltration**

🕒 10:30 AM - 11:00 AM, May 12

● **Drone-based scanning technology for characterizing the geometry and thermal conditions of building enclosure system for fast energy audit and design of retrofit strategies**

🕒 11:00 AM - 11:30 AM, May 12

● **Energy Modeling to Determine Optimum Order of Component Installation in Stepwise Retrofit Towards EnerPHit Standard**

🕒 11:30 AM - 12:00 PM, May 12

**Sessions D: Tools for Homebuilders**

🕒 10:30 AM - 11:30 AM, May 12

**Tools for Homebu...**

Moderator: Daniel Hindman

🗣️ **Speaker**



**Daniel Hindman**

Associate Professor  
Virginia Tech

2 Subsessions

● **Creating a Virtual Environment Data Collection Tool for Construction Safety**

🕒 10:30 AM - 11:00 AM, May 12

● **Likelihood to Recommend: A Mixed Methods Analysis of Consumer Perceptions of Home Builders**

🕒 11:00 AM - 11:30 AM, May 12

**Sessions D: Disaster Resilience**

🕒 10:30 AM - 12:00 PM, May 12

**Disaster Resilie...**

Moderator: Esther Obonyo

🗣️ **Speaker**



**Esther Obonyo**

Professor  
Penn State

1 Subsessions

● **Low Income Housing & Disaster Resilience: Presentations & Moderated Q&A**

🕒 10:30 AM - 12:00 PM, May 12

12:00 PM

**Lunch Break**

🕒 12:00 PM - 12:30 PM, May 12

12:30 PM

**Sessions E: High-Performance Housing**

🕒 12:30 PM - 2:00 PM, May 12



High-Performance Ho...

Moderator: Michal Bartko

Speaker



**Michal Bartko**

Research Officer  
National Research Council Canada

3 Subsessions

● **Site Net Zero Target Contemporegional Architecture – The Barn Haus in Utah**

⌚ 12:30 PM - 1:00 PM, May 12

● **The Intersection of Passive House and Affordability in Cold Climate**

⌚ 1:00 PM - 1:30 PM, May 12

● **Residential Construction**

⌚ 1:00 PM - 1:30 PM, May 12

● **Reducing Interior Overheating of Residential Buildings by Passive Cooling**

● **Measures**

⌚ 1:30 PM - 2:00 PM, May 12

**Sessions E: Retrofits**

⌚ 12:30 PM - 2:00 PM, May 12

Retrofits

Moderator: Pat Huelman

Speaker



**Pat Huelman**

Associate Extension Professor  
University of Minnesota

3 Subsessions

● **Comparing Affordable, Durable and Energy Efficient Wall Retrofit Systems**

⌚ 12:30 PM - 1:00 PM, May 12

● **Hygrothermal simulation of exterior retrofits in a cold climate**

⌚ 1:00 PM - 1:30 PM, May 12

● **Insitu Testing for PNNL/ORNL/UMN Deep Wall Insulation Upgrade Project**

⌚ 1:30 PM - 2:00 PM, May 12

**Sessions E: Building in Alaska**

⌚ 12:30 PM - 2:00 PM, May 12

Building in Ala...

Moderator: Jose Duarte

Speaker



**Jose Duarte**

Director - Stuckeman Center for Design Computing  
Penn State

3 Subsessions

- **Design of homes for concrete printing in the permafrost regions of Alaska**  
🕒 12:30 PM - 1:00 PM, May 12
- **Structural Evaluation of a proposed concrete 3D printed Habitat in remote Alaska**  
🕒 1:00 PM - 1:30 PM, May 12
- **A comparison of thermal insulation strategies for 3D printed concrete structures in cold regions**  
🕒 1:30 PM - 2:00 PM, May 12

**Session E: Disaster Resilience**

🕒 12:30 PM - 2:00 PM, May 12

Disaster Resilie...

Moderator: Theresa Gilbride

🗣️ Speaker



**Theresa Gilbride**  
Energy-Efficiency Researcher  
Pacific Northwest National Laboratory

3 Subsessions

- **Building for Energy Efficiency and Disaster Resistance: Complementary Goals, Most of the Time**  
🕒 12:30 PM - 1:00 PM, May 12
- **A parametric investigation of canopy heat islands mitigation strategies: A case study of a new residential development master plan of a U.S. north-eastern city**  
🕒 1:00 PM - 1:30 PM, May 12
- **Small-Scale Testing of Air Barrier Systems Adhered on Sheathing Panels Under In-plane Relative Displacement Simulating Seismic Effect**  
🕒 1:30 PM - 2:00 PM, May 12

2:15 PM

**Round Table Networking Session**

🕒 2:15 PM - 2:45 PM, May 12

3:00 PM

**Sessions F: Retrofits**

🕒 3:00 PM - 4:30 PM, May 12

Retrofits

Moderator: Katherine Cort

🗣️ Speaker



**Katherine Cort**  
Senior Economist  
Pacific Northwest National Laboratory

### 3 Subsessions

#### ● Siding Retrofits – Never a Better Time to Upgrade Wall Insulation and Windows

🕒 3:00 PM - 3:30 PM, May 12

#### ● Determining Energy Savings for Various High Performance Ventilated Attic (HPVA) Roof Retrofits

🕒 3:30 PM - 4:00 PM, May 12

#### ● A Zero-carbon Bio-based Wall Panel as an Energy Retrofit Solution for Buildings

🕒 4:00 PM - 4:30 PM, May 12

### Sessions F: Building in Alaska

🕒 3:00 PM - 4:30 PM, May 12

Building in Ala...

Moderator: Kristen Cetin

#### 🗣️ Speaker



**Kristen Cetin**

Assistant Professor  
Michigan State University

### 3 Subsessions

#### ● Building Durability in Extreme, Changing Climates

🕒 3:00 PM - 3:30 PM, May 12

#### ● Addressing the Housing Infrastructure Challenges of Rural Alaska in a Changing Climate: Physical Characteristics of Residential Infrastructure

🕒 3:30 PM - 4:00 PM, May 12

#### ● Design, Construction, and Field Validation of a Blown-in Fiberglass Wall System in a Cold, Wet, and Windy Climate

🕒 4:00 PM - 4:30 PM, May 12

4:45 PM

### Indigenous Wisdom and 21st Century Technologies: An Arctic Approach to Building Science

🕒 4:45 PM - 6:00 PM, May 12

Closing Plenary

Closing Remarks

In the closing plenary, hear about some of the demonstration projects the Cold Climate Housing Research Center in Alaska has accomplished over the past 22 years based on their applied research and close collaborations with the North's First People. Indigenous populations in the Arctic have faced adaptation and challenges before, yet have proven their resilience and ability to rebound. They do not disconnect themselves from the land or environment. They are one in the same vs. the Western perspective that we simply "live" on a particular piece of land. This indigenous perspective is a vital one for humanity's survival and well-being. The Arctic is experiencing some of the most accelerating and dramatic impacts of a changing climate. Acknowledgement and inclusion of indigenous people in all the discussions is critically important to help guide our path forward. The health of the planet and the people who live on it will need both Indigenous Wisdom and 21st Century technology to ensure that the next 500 generations have a home on our beautiful planet.

#### 🗣️ Speaker



**Jack Hébert**

Founder CCHRC and Senior Research advisor NREL  
Cold Climate Housing Research Center-NREL

1 Subsessions

● **Closing Remarks**

⌚ 5:45 PM - 6:00 PM, May 12