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**American Concrete Institute
Pittsburgh Area Chapter**

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Fall 2022

Chapter News

Concrete In the Steel City



Chapter News

– Turning Buildings into Carbon Storage Structures

University of Pennsylvania to receive research funding

The University of Pennsylvania (Penn) has been selected to receive \$2.4M in funding from the U.S. Department of Energy Advanced Research Projects Agency-Energy (ARPA-E). The funding is part of the ARPA-E HESTIA program, which prioritizes overcoming barriers associated with carbon-storing buildings, including scarce, expensive, and geographically limited building materials. The goal of the HESTIA program is to increase the total amount of carbon stored in buildings to create carbon sinks, which absorb more carbon from the atmosphere than released during the construction process.

Penn, in collaboration with Texas A&M University, The City College of New York, KieranTimberlake, and Sika, will design carbon-negative, medium-sized building structures by developing a high-performance structural system for carbon absorption and storage over buildings' lifespans. "We're taking a multi-scalar approach to minimize the impact of using concrete, which is the most ubiquitous construction material globally," said Masoud Akbarzadeh, Director of the Polyhedral Structures Laboratory and Assistant Professor of Architecture, Weitzman School of Design at Penn. "While on the macro level, we are introducing an innovative, efficient structural system, on the micro level, we are re-inventing the recipe for concrete to absorb carbon. The results of this research could be applied to a comprehensive building design strategy for all kinds of buildings."

The team will use a novel carbon-absorbing concrete mixture as a building material, and it will design and assemble a high-performance structural system with maximized surface area and minimized mass and construction waste. The parts will be prefabricated using robotic three-dimensional (3-D) printing technology.

"Geometry is what makes our team's designs unique, in both the printed structures and the formulation of the carbonabsorbing concrete. By also using bio-based materials, our structures will not only store carbon but offer enhanced load-bearing capabilities," said Shu Yang, Joseph Bordogna Professor of Engineering and Applied Science and Chair of the Materials Science and Engineering Department, School of Engineering and Applied Science at Penn.

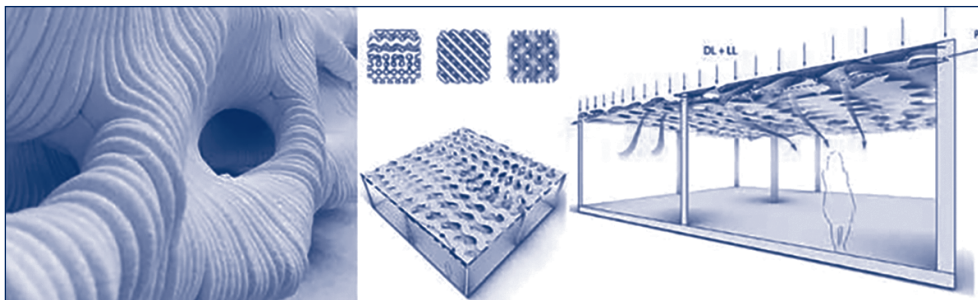


Image from the Polyhedral Structure Laboratory

"The right geometry produces the efficiency of the structures by reducing the amount of material—concrete, in this case—used, and consequently carbon emissions. Coupling the right form of structure and material will also help to absorb

more carbon from the atmosphere," said Mohammad Bolhassani, Director of Advanced Masonry Center at The Bernard & Anne Spitzer School of Architecture, The City College of New York.

The research bridges active and passive design approaches to thermal performance.

The increased surface area of the novel concrete structure is beneficial for achieving comfort temperature ranges indoors through thermal mass heat storage. "We will combine natural ventilation strategies with the

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Turning Buildings into Carbon Storage Structure *(From page 1)*

exposed concrete slab system to achieve a major reduction in the operational energy of the building over the building's life cycle," said Dorit Aviv, Director of the Thermal Architecture Lab, Weitzman School of Design at Penn.

"The novel construction system will combine strategies to exploit thermal mass with adaptive envelope and electrified building systems including heat pumps, to reduce operational carbon emission over the building's life cycle," said Zheng O'Neill, Associate Professor of Mechanical Engineering, J. Mike Walker '66 Department of Mechanical Engineering at Texas A&M University.

A building information modeling (BIM)-integrated life-cycle analysis (LCA) feedback loop will be used to identify the combined strategies to ensure carbon negativity on a cradle-to-gate and cradle-to-grave basis. "Our transdisciplinary team will engage the development of materials and systems holistically, developing LCA workflows to understand how components of the building contribute collectively to carbon negative design," said Billie Faircloth, Partner and Research Director at KieranTimberlake.

The project team includes: Masoud Akbarzadeh, Principal Investigator (PI), Dorit Aviv (co-PI), and Shu Yang (co-PI) from Penn; Peter Psarras, Research Assistant Professor in chemical and biomolecular engineering at Penn; Zheng O'Neil (co-PI) from Texas A&M University; Mohammad Bolhassani (co-PI) from The City College of New York; Billie Faircloth (co-PI), KieranTimberlake, and Ryan Welch, Principal, KieranTimberlake; and Didier Lootens, Head of Research and Development, Sika Switzerland.

Reprinted courtesy of the University of Pennsylvania.

ACI – PITTSBURGH AREA CHAPTER FALL 2022/SPRING 2023 CERTIFICATION SCHEDULE

ACI Concrete Field Tech – Grade I	Location
Nov 21-22, 2022	Castle Builders Supply, Hermitage, PA
December 12-13, 2022	Ligonier Stone & Lime, Latrobe, PA
January 9-10, 2023	J.J. Kennedy, Inc. – Shippensburg, PA
January 16-17, 2023	DuBrook – Clarion, PA
January 16-17, 2023	New Enterprise Stone & Lime – Roaring Spring, PA
February 13-14, 2023	Golden Triangle Construction – Imperial, PA
February 27-28, 2023	Stone & Company – Greensburg, PA
Concrete Strength & Aggregate Testing Tech	Location
January 28, 2023	Pittsburgh Area <i>Minimum of 10 registrants required to hold a class</i>
Concrete Flatwork Finisher/Tech	Location
February 11, 2023	Golden Triangle Construction - Imperial
To download a registration form or to register on-line log onto: www.acipgh.org	



Pittsburgh Chapter of the ACI Library



Did you know.... The Chapter Library contains copies of many ACI publications. Visitors may research information at the Library and some publications can be signed out. The Chapter Library is located at:

University of Pittsburgh
Department of Civil & Environmental Engineering
705 Benedum Hall
3700 Ohara Street
Pittsburgh, PA 15261

Library Operation Policies

- Library hours are from 8:30 AM – 4:30 PM, Monday – Friday.
- For library access, please call in advance at 412.624.9879.
- A list of publications in the ACI Chapter Library is available on our website. Pay-per-page copy machines are available in the lower level of the building. Note that some publications are available only on CD-ROM, so consider bringing a portable computer with the ability to print to a pdf file.
- A desk and table are available in the library room.
- Most materials can be borrowed for a duration of up to two weeks. Periods longer than two weeks must be arranged in advance.
- The Manual of Concrete Practice (paper volumes and CD-ROM) shall not be removed from the building.
- Assistance will be provided for signing out all library publications. Your name, affiliation, e-mail address, phone number and ACI member number will be required to sign out publications, and a due date will be provided.
- Coffee, soft drinks, and food items are available for purchase in the café located in the lower level of the building. Please keep the library clean!

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PITTSBURGH AREA CHAPTER UPCOMING EVENTS

MEMBER MEETINGS

2022

November 9th, December 14th

2023

January 11th, February 8th, March 29th

Visit our website for a list of upcoming events at www.acipgh.org/calendar-of-events.

Be sure to check the website frequently for updates. In addition, our meeting minutes are posted there for review. When possible, members are welcome to observe board meetings, for a better understanding of our Chapter and its activities.



8th Annual Excellence in Concrete Project Award



We encourage you to submit a project for the 8th Annual Excellence in Concrete Project Award – and share the opportunity with others in the Pittsburgh area concrete community – whether they are a member of ACI or not.

Please be on the lookout for the latest application at www.acipgh.org.

Your help is needed to make this program successful!

FOUNDERS AWARDS 2022~2023 ACADEMIC YEAR

The Pittsburgh Area Chapter of the American Concrete Institute established this Award in 1988 to provide financial assistance for undergraduate students with an interest in the areas of cement technology, concrete technology, design or construction.

To receive consideration, a student must be currently enrolled into an undergraduate program at an institution, and/or originally reside, ***within the boundaries of the Pittsburgh Area Chapter***. (Past recipients of the Founders Award are not eligible.).

At this time, we are accepting applications for the 2022/2023 academic year. To be a candidate for this award, the student must submit the following: the Founders Award application; a letter of transmittal, an official copy of their transcript of grades; and two letters of recommendation.

Applications must be received by January 31, 2023.

If you would like to obtain an application form or additional information, go to www.aci-pgh.org and click on click on the 'Awards' tab.

Chapter News is published by the American Concrete Institute, Pittsburgh Area Chapter for the purpose of informing members and others about issues of concern to the concrete industry. If you have information to include in this publication or any comments, contact ACI Pittsburgh Chapter at 724-452-1468.