Astronomers and physicists believe the universe isn’t static, but rather always growing and expanding. Over the past year, I have begun to believe the same may be true of the Charles Pankow Foundation, as growth and expansion abound.

CPF, from its very beginning, has been the beneficiary of generous support. Lately, however, that support has increased to new heights—in the form not only of financial contributions but also in-kind services and materials that greatly offset laboratory expenses, as well as priceless assistance in helping to conceive and monitor our research initiatives. And while it’s tempting to account for this support by simply adding the nominal dollars, its actual value is multiples of this amount as the less tangible assistance helps ensure the Foundation is focused on the most meaningful research opportunities and that, when complete, we have a fully prepared cadre of stakeholders to help guarantee the resulting innovations are understood and adopted by the industry.

Part of CPF’s expanding universe should come as no surprise. It flows directly from the broadened research domains that we are pursuing. Building envelope standards—including best practices in subcontracting, carbon/energy use, and structural suitability research—will assist both owners and project teams in designing smarter, more efficient structures. This, in addition to our ongoing work in wastewater, technology, and especially structural engineering, has attracted the attention of major corporations, federal and state agencies, and universities who believe in the promise of our work and see the potential direct benefit to them.

For all you who provide the invaluable assistance that extends the impact of the Charles Pankow Foundation, our heartfelt thanks. For those of you just learning of our work, join us as we endeavor to make innovation an expanding reality in the built environment.

Richard M. Kunnath
Richard M. Kunnath, P.E.
Board President, Charles Pankow Foundation
2021 Active Grant Portfolio

Overview
15 Projects
$4M Grants
14 Institutions

Industry Partners
31 Project Investors
37 Material Contributors
213 Knowledge Contributors

Results
Go-to Resources
Game-changing Systems
Decision-making Digital Tools

Impact
Safer Construction Conditions
Project Cost and Schedule
Savings and Reliability
Improved Building Performance

Research Projects by Topic
- Concrete 27%
- Steel 27%
- Project Delivery 20%
- Performance-Based Design 20%
- Means & Methods 6%
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- Project Delivery 20%
- Concrete 27%
2021 Grant Portfolio Contributors

The Charles Pankow Foundation extends its sincere appreciation to our 2021 grant portfolio contributors. These champions of innovation provide inspired thinking, resources, and the know-how to drive industry best practices forward.

Financial
ACI Foundation
American Institute of Architects
American Institute of Steel Construction
Association of Drilled Shaft Contractors - International
Association of Foundation Drilling
Atlas Tube/Zekelman
Chandos Construction
Clark Pacific
Construction Industry Institute
Construction Institute of the ASCE
CRSI Education and Research Foundation
Design Build Institute of America
DesignIntelligence
Hensel Phelps
Integrated Project Delivery Alliance
Keller Companies
Kiewit
Kraemer NA
Martin/Martin
McCarthy
Metromont
MKA Foundation
Nucor
P1 Consulting
Pankow Builders
Parsons Corporation
Precast/Prestressed Concrete Institute
Process Industry Practices
Schuff Steel
Siefert Associates
Steel Institute of New York
Stellar
2021 Grant Portfolio Contributors

Knowledge
Farid Alfawakhiri
Dylan Allen
Markku Allison
Neal Anderson
Scott Anderson
Christine Angleton
Esteban Anzola
Baabak Ashuri
Kevin Aswegan
Suzanne Aultman
Mantu Baishya
Keith Bauer
Reza Bayat
Jim Bedrick
Glenn Bell
Brian Bennett
Mark Bennett
Stephen Benton
Evan Bentz
Kal Bensuska
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Robert Berhinig
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Tanner Blackburn
Geoff Bomba
Scott Bondi
Joe Bove
Jared Brewe
Michel Bruneau
Vince Cammalleri
Renée Cheng
Rachel Chicchi
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Lisa Choe
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Tom Culp
Charlie Ćurčija
Dave Darwin
Don Davies
Greg Deierlein
Mark Denavit
Daniel de Oliveira
John Donatelli
Carrie Sturts Dossick
Rick Drake
Jason Duff
Bill Earl
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Sal Khalaf
Kevin Kirkley
Sue Klawans
Danielle Kleinhans
Ronald Klemencic
Kelly Knowles
Walter Korkosz
Lawrence Kruth
Daniel Kuchma
Rik Kunnath
Gino Kurama
Nesseline Kuscu
Tom Kuznik
Katerina Lachinova
Randy Landers
Russell Larson
Ivan Lee
Roberto Leon
Dan Lemieux
Dimitrios Lignos
Brett Lord
Jim Malley
Brad Malmsten
Bonnie Manley
2021 Grant Portfolio Contributors

Rick Marshall  John Peronto  Mathew Thomas  Clark Pacific
Ann Masek  Bill Perry  Peter Timler  Commercial Materials Company
Therese P. McAllister  Jim Perry  Fernando Torrealva  Concentric Steel
Virginia McAllister  Jack Petersen  Christina Trotter  Contractors Materials Company
Matt K. McCaulley  Justin Ramer  Amy Trygestad  Dayton Superior
Mark McClintock  Dan Rawlings  Chia Ming Uang  Geiger and Peters
David McCrary  Thomas Rawls  Catherine Valenzano  Harris Rebar / Nucor
Ian McFarlane  Paul Richards  Allan Van Horn  Headed Reinforcement Corp.
Dudley McFarquhar  Eloy Rodriguez  Amit Varma  J.F. Stearns
Donald Meinheit  Juliana Rochester  Jeff Veilleux  Janell Concrete and Masonry Equipment
Ron Meng  Ken Roko  Mason Walters  Level 10 Construction
Duane Miller  Mark J. Rothman  Lisa Washington  L&M Industrial Fabrication
Jack Moehle  Rafael Sabelli  Steve Weinryb  Metals Fab
Jon Mohle  Thomas Sabol  Brad Whitaker  Metromont
Keith Molenaar  Cheryl Saldanha  Joe Willich  Midwest Concrete Materials
Eric Montplaisir  Dave Sanders  Joseph C. Windover  Nucor
Judi Mosqueda  Helen Sanders  David Wright  nVent LENTON
Chris Motter  Mike Santarone  Dave Zanetell  PJ’s Rebar
Joshua Mouras  Ben Schafer  Farzin Zareian  Pacific Earthquake Engineering Research Center
Kai Ki Mow  Bahram Shahrooz  Wael Zatar  Pacific Steel Group
Sean Mulholland  Jennifer Shane  Duff Zimmerman  Sherwin Williams
Javeed Munshi  Phil Sheridan  Joe Zona  Sika
Tim Murphy  Vincent Siefert  Material
John Neary  Lyle Sieg  Alamillo Rebar  SLS Consulting
Ralph Nicastro  Jon Siu  Baker Concrete Construction  Supreme Group
Cory Ochsner  Robert Solomon  Baker Equipment and Materials  Tate Inc.
Andy Osborn  Peter Speier  BarSplice Products  Terracon Consultants
Laura Osburn  Laura Stagner  Cascade Steel  The Pressure Grout Company
Louise Pannetor  Tabitha Stine  Catalina Pacific, a CalPortland Company  Tincher’s Welding
Shailendra Patel  John Straube  Cives Steel  Turner Construction
Viral Patel  Andrew Taylor  Williams Form Engineering  Joe Zona
Mic Patterson  Dana Taylor

Material
Alamillo Rebar
Baker Concrete Construction
Baker Equipment and Materials
BarSplice Products
Cascade Steel
Catalina Pacific, a CalPortland Company
Cives Steel
Research Grants Awarded in 2021

$250,000
UNIVERSITY OF CALIFORNIA, LOS ANGELES
John W. Wallace, Ph.D., P.E.
Performance and Repair of Ordinary Structural Walls Subjected to Wind and Seismic Loading Protocols (RGA #01-21)

$198,961
STATE UNIVERSITY OF NEW YORK AT BUFFALO
Michel Bruneau, Ph.D., P.Eng.
Bolted Splice Details for Composite Plate Shear Walls—Concrete Filled (RGA #02-21)

$168,053
UNIVERSITY OF FLORIDA
Bryan W. Franz, Ph.D. with Daniel Hall, Ph.D. of ETH Zürich
Expanded Guides to Managing the Design Phase of Design-Build Projects (RGA #03-21)

$138,920
IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY
Jennifer Shane, Ph.D.
Expanded Guides to Managing the Design Phase of Design-Build Projects (RGA #04-21)

$87,031
UNIVERSITY OF NEW MEXICO
Susan Bogus Halter, PE, Ph.D.
Expanded Guides to Managing the Design Phase of Design-Build Projects (RGA #05-21)

$11,898
PURDUE UNIVERSITY
Amit H. Varma, Ph.D.
Seismic and Wind Behavior and Design of Coupled CF-CPSW Core Walls for Steel Buildings (Amendment to RGA #06-16)

Test specimen for “Improving the Safety of Rebar Cages by Using Innovative Connectors” research conducted at University of Nevada, Reno in conjunction with the ASCE Construction Institute.
Creating the Foundation for Synergy

**syn·er·gize**

/ˈsɪnərˌjɪz/

verb
to combine or coordinate the activity of (two or more agents) to produce a joint effect greater than the sum of their separate effects.

Traditionally, the construction industry has operated in a fragmented manner—with project developers discreetly engaging architects, designers, engineers, and contractors. While team members may each have a clear idea of their specific role within a project, they might not have the vision of the larger project itself in mind—nor of how their work impacts that of others on the project team. This disconnect can lead to inefficiencies, conflicts, and an end product that is not fully optimized for the building occupant. And it stymies innovation.

The Charles Pankow Foundation (CPF) supports research and industry activities that seek to integrate and streamline the design and construction processes and deliver structures optimized for building performance. We bring together the best minds from across the AEC industry to develop synergistic solutions that improve financial, environmental, and social outcomes for all project participants. The fruits of our labor are practical guides and tools for use by designers and builders everywhere.

The Foundation is now making these assets freely available to practitioners and the public alike on our revamped website. Our new **Library of Resources** compiles CPF-supported research reports, design recommendations, case studies, user guides, pre-standards, and more—all searchable by deliverable type and/or subject matter. Topics include building information modeling, concrete, exterior wall systems, performance-based design, project delivery, steel, and sustainability.
Forging Synergies

Knowledge is not created in a vacuum—but rather through the exchange of ideas and the testing of hypotheses. Creative collaboration, properly focused, can provide critical insights into solving design challenges that transcend even those of the most discerning individual in a given group. CPF’s synergistic approach identifies a challenge, assembles cross-disciplinary experts to analyze and address the relevant issues from diverse perspectives, and drives team members to produce workable solutions.

A primary tool that the Foundation uses to generate these synergies is focus group workshops—in which expert opinions are surveyed; data is collected and analyzed; and solutions are developed for the challenges identified. Over the past year, CPF has held workshops with stakeholders from around the industry—including architects, engineers, academicians, manufacturers, and others—on two topics: curtain walls and managing the design phase of a design-build project.

Workshop on Curtain Wall Research

Thirteen industry leaders were convened for a focus group on curtain wall research that centered on four general themes:

• Guidance to clarify roles, responsibilities, and processes involved in curtain wall systems;
• Technical/performance of such systems addressed through research;
• Innovation/materials and systems to deliver better performance; and
• Workforce/education skill and knowledge programs.

Takeaways from the workshop include engaging in research to understand thermal performance of curtain wall systems to inform design execution and ultimately improve energy performance of buildings. A second area of focus going forward will be the development of guidance to foster better collaboration across the industry to define roles, responsibilities, and workflows—and to cultivate a curtain wall-smart workforce to improve the procurement, design, execution, and maintenance of building curtain wall systems.
Forging Synergies

Workshop on Managing the Design Phase of a Design-Build Project

Eleven leaders from across the AEC industry participated in a workshop to consider the current Design Management Guide (DMG) and potential future editions. A number of opportunities were identified to update and extend the guide’s knowledge and best practices throughout the industry and to support project success through the management of the design phase of a design-build project. Recommendations from the workshop included the development of:

• A new over-arching, universally applicable (i.e., market sector/client/project size-agnostic) principles-based guide;
• Multiple market-sector and client-specific guides (e.g., buildings, aviation, federal, specialty trades); and
• An updated DMG to reflect current state-of-practice models sector guides, organized by project phase and with additional content to include entries on topics such as BIM execution plan, design delegation, how to raise performance topics, and checklists of deeds to be addressed.
Profiles in Synergy

While forging synergies among diverse parties in the value chain is key to creating new industry knowledge, distilling this insight into actionable recommendations—and sharing them with both industry professionals and the wider public—are essential to driving industry practice forward.

For this reason, the Foundation chronicles its success in pushing research into the field via the publication of case studies. Each case study outlines a challenge faced by designers and builders, the solution pursued, and the result/deliverable that followed. Written and illustrated for both laymen and industry professionals alike, the case studies document how the power of synergy can reimagine and drive best practices in building design and construction.

Following are synopses of the first seven case studies published.

Embodied Carbon in Construction Calculator

Catalytic investment by the Charles Pankow Foundation and over 30 future-focused organizations supported the collaborative development of the Embodied Carbon in Construction Calculator (EC3) tool. This open-access digital tool allows designers and contractors to assess and compare the embedded carbon in different building materials, helping them to choose more sustainable options during the design, material specification, and procurement processes.
Profiles in Synergy

Managing the Design Phase of a Design-Build Project

CPF recognized the need to centralize best practices for design-build and develop better approaches to design and construction project delivery. Convening leaders from across the AEC industry, the Foundation funded the creation of the Professional’s Guide to Managing the Design Phase of a Design-Build Project, which aims to help owners, designers, and builders of design-build projects achieve success by utilizing a design phase manager.

SpeedCore Modular Framing System

With the objective of bringing greater efficiency to high-rise construction projects, the Charles Pankow Foundation, in collaboration with industry partners, supported key experimental tests to inform the design of a novel wall system. Dubbed SpeedCore, the system is constructed of prefabricated modular steel sandwich panels, stacked onsite and field-filled with concrete. Eliminating the need for temporary formwork and reinforcing steel cages simplifies onsite trade and material management, saving time and potentially lives.

Tall Building Initiative - Performance-Based Seismic Design

Lack of a common approach to performance-based seismic design of tall buildings has traditionally led to excessive delays in permitting projects, particularly in earthquake-prone regions. CPF funding helped forge development of a new performance-based design methodology allowing the use of conventional framing systems at greater heights that has cut permit review and approval times from 1-2 years down to 6-10 months.

Modernizing Building Codes for Wind

Prescriptive building codes established in the 1970s hadn’t kept up with the trend toward ever-taller, more complex 21st-century buildings. The ASCE 7 Wind Loads Subcommittee recognized the need for updated wind load design methodologies applicable to modern buildings of varying shapes and sizes. With grant funding from CPF and industry partners including NCSEA, wind tunnel testing provided the aerodynamic data required for the launch of a project that can form the basis for establishing a common methodology for the wind load design provisions in ASCE 7.
Profiles in Synergy

Building Code Requirements for High-Strength Reinforcing Steel

For almost half a century, Grade 60 steel remained the industry standard for rebar in structural concrete—even as larger structures were designed and built. The Charles Pankow Foundation identified the research and testing that would be required to support the use of higher-strength reinforcement in concrete. Subsequent testing, supported by CPF with industry partners ACI Foundation and CRSI Foundation, led to the inclusion in the ACI 318 Building Code of specifications greatly expanding the use of higher-strength steel reinforcement in concrete.

Prestandard for Performance-Based Wind Design

Traditionally prescriptive approaches to building design limited their ability to be engineered for efficient material usage, post-event building functionality, and reduced economic losses due to hazards such as high winds—particularly as buildings have grown in height and complexity of shape. With CPF and industry funding, structural engineering leaders convened and developed a 21st-century approach to the design of buildings for wind loads detailed in the ASCE publication *Prestandard for Performance-Based Wind Design*. 
Charles Pankow Foundation Leadership Team

Richard M. Kunnath P.E., NAC  
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Timothy P. Murphy, Esq.  
Board Secretary and Chief Financial Officer

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