



# Building Innovation Through Research

CASE FOR SUPPORT

# REIMAGINE. ADVANCE. DELIVER.

## 2020 Annual Report



CHARLES PANKOW  
FOUNDATION

Building Innovation through Research

The Charles Pankow Foundation is an independent, private, grant-making research foundation delivering better ways to design and build. We invest catalytic capital in leaders and organizations working to drive industry change. Our ambitions are large-scale and require collective action and significant levels of investment, know-how and influence. We collaborate with many, leveraging our collective resources. All work product is publicly shared for collective use and industry change.

Our current investment priorities enable design and construction of buildings to reliably attain desired construction, post-hazard, and environmental performance including cost, schedule, safety, protection of occupancy usage, post-hazard repair costs and embodied carbon.

The Foundation supports research in the following areas:

- Building structure: Rethinking how buildings are designed and built
- Collaborative project delivery: Integrating the design and construction processes
- Environmental transparency: Enabling evidence-based design and procurement decisions to reduce impacts



## VISION

TO PROVIDE THE AEC INDUSTRY WITH A BETTER WAY TO DESIGN AND BUILD



## MISSION

TO BE A CATALYST TO ADVANCE INNOVATION IN THE DESIGN AND CONSTRUCTION OF BUILDINGS

*The Charles Pankow Foundation is incorporated as a nonprofit, public benefit, charitable foundation with 501(c)(3) status and operates independently of the Pankow Companies. The Foundation carries forward the spirit of Charlie Pankow's legacy, vision, innovation, and leadership.*



## PRESIDENT'S LETTER

This year has presented virtually all companies, organizations and individuals with both challenges and opportunities. On one hand, university laboratories have been closed for the majority of the year making it impossible for the Charles Pankow Foundation to complete much of its scheduled research. On the other, we have had the time and resources to plan and complete other necessary work, including meeting (virtually) with new industry partners and academic faculties.

The summary of all this is that the Foundation adapted to the hand it was dealt and managed to achieve much more than what was initially believed possible. Some of our many accomplishments include:

- Completion of five research projects and related research reports, publications and tools. These include:
  - *“Performance-Based Structural Fire Design: Exemplar Designs of Four Regionally Diverse Buildings using ASCE 7-16, Appendix E”*
  - *“Structural Fire Engineering and Design of Filled Composite Plate Shear Walls (SpeedCore)”*; *“Fire Design of SpeedCore Walls and CFT Columns”*; and *“Fiber Tool User Guide for Fire Design of SpeedCore Walls and CFT Columns”*
  - *“Determination of Pressure Coefficients for High-Rise Buildings of Different Aspect Ratios, Final Report”*
  - *“Development and Splice Lengths for High-Strength Reinforcement, Volume 1: General Bar Development”* and *“Volume 2: Drift Capacity of Structural Walls with Lap Splices”*
  - Embodied Carbon in Construction Calculator Tool (EC3)
- Approval of two new *Research Initiatives* which will represent a significant dedication of Foundation resources for the next few years.
  - Building Enclosures. This area will focus on the many aspects of glass and glazing, precast concrete and other forms of building cladding. Specific opportunities include movement and tolerances, heat and moisture transfer and guides to clarify roles, responsibilities, process and more.
  - Design Management Guides. An expansion of the current guide which is primarily focused on buildings and general contractors to include industry advancements such as building information modeling, new audiences, such as specialty sub-contractors, and new segments of the industry, such as water and wastewater among others.
- Industry recognition of Foundation board members and staff including:
  - Board President Rik Kunnath received BuiltWorlds Maverick, industry leader recognition
  - Board Director Ron Klemencic was inducted into the National Academy of Engineers
  - Board Director Glenn Bell was named ENR Top 25 Newsmaker of the Year
  - Executive Director Anne Ellis received the American Concrete Institute Strategic Advancement Award, 2020

As we round the corner and put 2020 in the rear-view mirror, we are grateful for the ever-increasing number of individuals and organizations who provide time, talent and treasure to help the Charles Pankow Foundation do its work. For each of you, thank you so much. You represent what is the very best about the AEC industry and it is because of you we are more optimistic than ever about the progress we will achieve in the year ahead.

Richard M. Kunnath, P.E.  
Board President, Charles Pankow Foundation



# 2020 GRANT PORTFOLIO

## Overview

**17**  
projects

**\$5M**  
grants

**10**  
institutions

## Industry Partners

**60**  
project co-funders

**20**  
material contributors

**150**  
knowledge contributors

## Impact

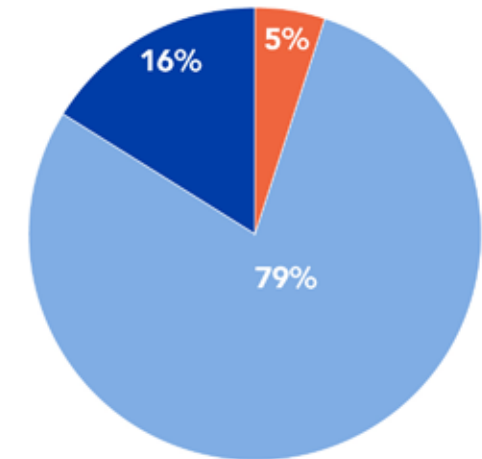
**Embodied  
Carbon  
Reductions**

**Safer  
Construction  
Conditions**

**Project Cost  
+ Schedule  
Savings**

**Hazard  
Performance  
Predictions**

## Portfolio by Dollars Invested



- Performance-Based Design Guides
- Laboratory Research for Novel Systems + Advanced Construction Materials
- Project-level Embodied Carbon Accounting Tool

## 2020 RESEARCH GRANTS

### COMPLETED

#### PURDUE UNIVERSITY

Robert J. Frosch, Ph.D., P.E. and Santiago Pujol, PhD  
*Development and Splice Lengths for High-Strength Reinforcement (RGA #02-17)*

#### PURDUE UNIVERSITY

Amit H. Varma, Ph.D.  
*Performance-Based Structural Fire Engineering of Buildings with Concrete-Filled Composite Plate Shear Walls (RGA #03-18)*

#### ASCE STRUCTURAL ENGINEERING INSTITUTE

Kevin J. LaMalva, P.E.  
*Advancing Performance-Based Structural Fire Engineering Design in the U.S. through Exemplar Procedural Guidance (RGA #04-18)*

#### UNIVERSITY OF WASHINGTON

Kathrina Simonen, AIA, S.E.  
*Embodied Carbon in Construction Calculator (RGA #06-18)*

#### ASCE STRUCTURAL ENGINEERING INSTITUTE

Donald R. Scott, P.E., S.E.  
*Determination of Pressure Coefficients for High-Rise Buildings of Different Aspect Ratios (RGA #04-19)*

### AWARDED

**\$85,500**

#### PURDUE UNIVERSITY

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

**\$42,000**

#### UNIVERSITY OF WASHINGTON

Kathrina Simonen, AIA, S.E.  
*Embodied Carbon in Construction Calculator (Amendment, (RGA #06-18))*

**\$245,242**

#### ASCE CONSTRUCTION INSTITUTE with UNIVERSITY OF NEVADA, RENO

Vincent A. Siefert, P.E.  
*Improving the Safety of Rebar Cages by Using Innovative Connectors (RGA #01-20)*

**\$216,000**

#### PURDUE UNIVERSITY

Amit H. Varma, Ph.D.  
*Composite Floor-to-SpeedCore Wall Systems: Performance-based Fire Resistance and Design (RGA #03-20)*

## REIMAGINE. ADVANCE. DELIVER.

Since 2006, the Charles Pankow Foundation — working with AEC industry partners and individual leaders — has invested time, expertise and funds to support non-proprietary research.

Collectively, we've **reimagined** the way the world is designed and built. We **advanced** innovation. And, we **delivered** fundamental change.

Over the years, the Pankow Foundation has shaped industry standards and practices through our industry-changing research and resources. The Foundation's work has inspired project teams, ignited collaboration, and delivered collective industry impact. The impact is demonstrated in select projects outlined in the recently published [Building Innovation Through Research - Case for Support](#).

The Foundation's activity continued during 2020: Our catalytic investments promise to continue to deliver results and change the way the AEC industry designs and builds in the 21st century.

“If the Foundation went away tomorrow, there would be a noticeable slowdown in the innovation of technology for designers to use in buildings and it would be more expensive.”

– Ronald Hamburger  
Senior Principal  
Simpson, Gumpetz & Heger  
Chair, ASCE7  
Standards Committee  
(2011 - present)

CHARLES PANKOW  
FOUNDATION

### Building Innovation Through Research

CASE FOR SUPPORT

# REIMAGINING HOW BUILDINGS ARE DESIGNED AND BUILT FOR FIRE

21st century owners need 21st century solutions, including those that fulfill expectations of building performance related to fire. Extensive research of the performance of structures at elevated temperatures, combined with advancements in simulation and analysis tools over the years, has provided the basis for additional methods of achieving fire protection while also establishing performance expectations.

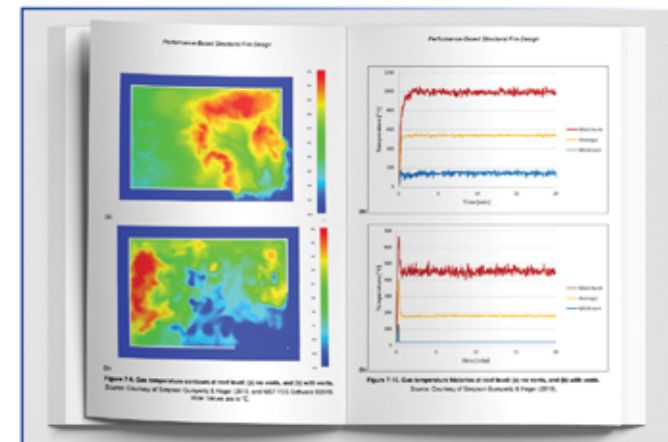
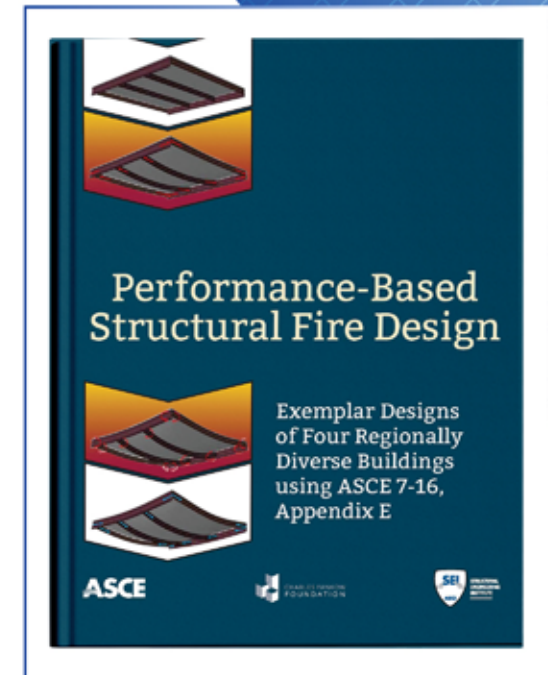
Using Performance-Based Structural Fire Design (PBSFD), owners can set expectations for performance, including re-occupancy after a fire. For steel-framed buildings, PBSFD allows consideration of both structural and applied fire protection to be used in achieving expectations and has the potential to affect multiple aspects of a project, from economics to outcomes.

Foundation investments in several projects strive to overcome barriers and impediments to implementation of PBSFD and transform standard practice in the United States.

## Performance-Based Structural Fire Design: Exemplar Designs of Four Regionally Diverse Buildings using ASCE 7-16, Appendix E

This study demonstrates the proper execution and potential benefits of PBSFD for structural fire protection as an alternative to the traditional prescriptive method. In this Foundation-funded project, four leading design teams applied the PBSFD principles to multiple building types in different geographic locations and demonstrated to structural engineers, architects, contractors, owners, and building officials the potential opportunities and challenges associated with this approach.

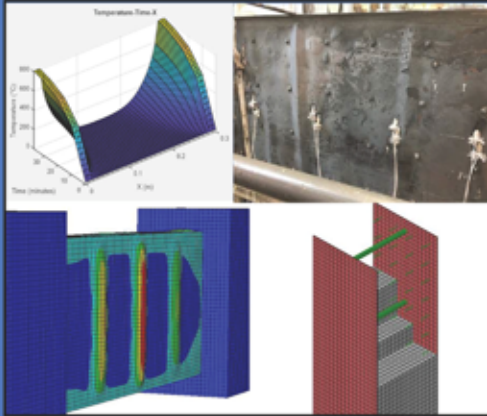
Download a copy of the [document](#), including the complete list of the future-forward design teams, academic institutions and organizations that contributed to this project.





### Structural Fire Engineering and Design of Filled Composite Plate Shear Walls (SpeedCore)

(CPF Research Grant # 03-18)



Ataollah Taghipour Anvari  
Saahastaranshu Bhardwaj, PhD  
Preshit Wazalwar  
Amit H. Varma, PhD

Purdue University  
Lyles School of Civil Engineering  
West Lafayette, IN



## Structural Fire Engineering and Design of Concrete-Filled Composite Plate Shear Walls (SpeedCore)

This [report](#) by researchers from Purdue University describes experimental and analytical studies that evaluated the performance of SpeedCore, the innovative panelized core wall system, when subjected to fire loading. Researchers developed design guidelines and recommendations for structural fire engineering as well as Fiber Tool, a [computer program](#) that simulates the behavior of composite walls and columns subjected to fire loading. Co-funding and expertise was provided by the American Institute of Steel Construction and Steel Institute of New York. This builds upon the previous co-funded research of SpeedCore, used in the 850-foot tall Rainier Square Tower in Seattle, WA, and credited for shaving construction time by 43%.

## Composite Floor-to-SpeedCore Wall Systems: Performance-Based Fire Resistance and Design

A new Foundation-funded project is underway at Purdue University that will conduct experiments and develop analytical studies to support the development of performance-based fire-resistant design guidelines and provisions for composite floor systems, and wall-to-floor connections to the SpeedCore wall system. This industry collaboration is supported with co-funding and expertise provided by the American Institute of Steel Construction, the Steel Institute of New York, and the MKA Foundation.



# ADVANCING WIND DESIGN

The AEC industry has benefited from advances in technology over the last 40+ years — advanced analytic and design tools, building information modeling, software applications, databases, GIS, etc. These tools enabled the design of more spectacular buildings. Yet, as buildings have changed and become more complex, our design for wind remains grounded in guidance and methodology from the 1970s.

## Collaborating to Advance Wind Design

A call to action to the structural engineering profession to conduct a systematic study using modern wind tunnel test methods generated an overwhelming response. The National Council of Structural Engineers Associations, along with 15 firms and individual professional leaders, responded to the call to help fund much needed testing. The Foundation awarded a grant to the Structural Engineering Institute of the American Society of Civil Engineers (ASCE).

Shaped by the Wind Loads Sub-Committee of ASCE and conducted at the University of Western Ontario, this research — **Determination of Pressure Coefficients for High-Rise Buildings of Different Aspect Ratios** — exemplifies the collective impact that's possible through collaboration. This research informs changes that will modernize and simplify codes addressing wind design of buildings in the U.S.

 CHARLES PANKOW FOUNDATION |  SEI STRUCTURAL ENGINEERING INSTITUTE

**ANSWERING THE CALL:  
ADVANCING THE INDUSTRY**

The Charles Pankow Foundation and the Structural Engineering Institute of ASCE say thank you to the following collaborators — funding much needed industry research to advance wind design.

**JOIN IN**

[www.pankowfoundation.org](http://www.pankowfoundation.org)

GLENN & JUDY BELL  
PETER A. IRWIN, PH.D., P.ENG.  
CPP WIND ENGINEERING & AIR QUALITY CONSULTANTS  
DEGENKOLB ENGINEERS  
GILSANZ MURRAY STEFICEK LLP  
HATFIELD GROUP  
KPFF  
LERA CONSULTING  
STRUCTURAL ENGINEERS  
MAGNUSSON KLEMENCIC ASSOCIATES FOUNDATION  
NABIH YOUSSEF ASSOCIATES  
STRUCTURAL ENGINEERS  
NATIONAL COUNCIL OF STRUCTURAL ENGINEERS ASSOCIATIONS  
ODEH ENGINEERS, INC.  
PCS STRUCTURAL SOLUTIONS  
SILMAN  
SKIDMORE, OWINGS & MERRILL  
STRUCTURAL FOCUS  
WALTER P MOORE AND ASSOCIATES, INC.

## DELIVERING IMPACT

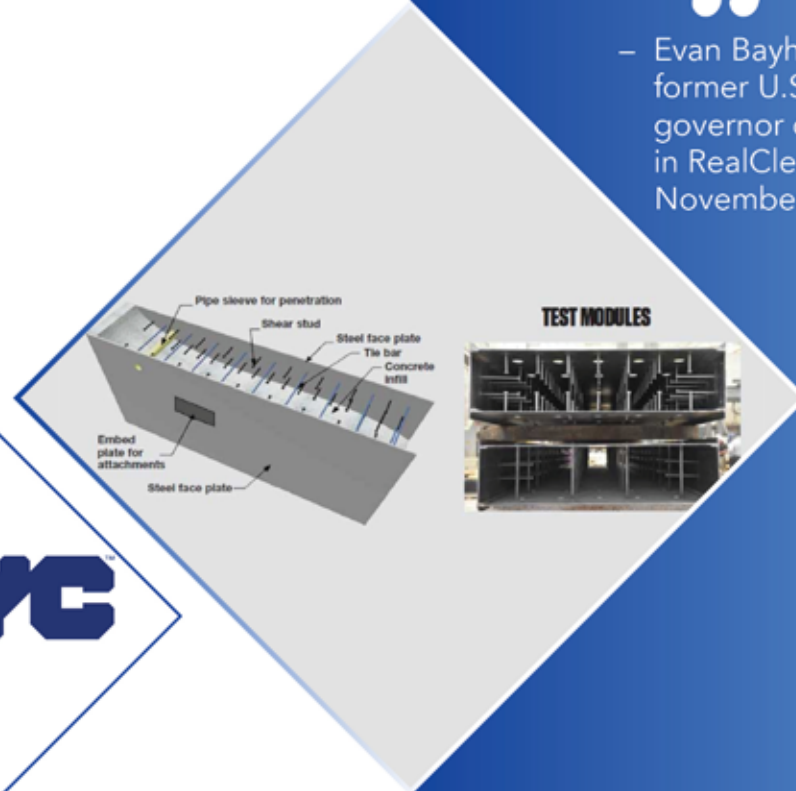
Staying true to the wishes of our namesake, Charles Pankow, the Foundation invests in non-proprietary research and resources to maximize its impact and advance the entire AEC industry.

### SpeedCore Gaining Acceptance

[SpeedCore](#), the innovative lateral support system for tall buildings used for the first time in the Rainier Square Tower in Seattle, WA, achieved another milestone in 2020. The New York City Department of Buildings granted permission to use the innovative construction approach that makes delivering tall structures faster and safer. This approval from New York City underscores the impact those with the courage and genius can have to advance innovation.

“It is direct investments in innovations, like SpeedCore, that can save millions of dollars in construction costs, allow for earlier occupancy of a new building, and be built with materials produced in the USA.”

– Evan Bayh,  
former U.S. senator and  
governor of Indiana  
in RealClearPolitics,  
November 18, 2020



## Helping the Environment by Reducing Carbon Emissions

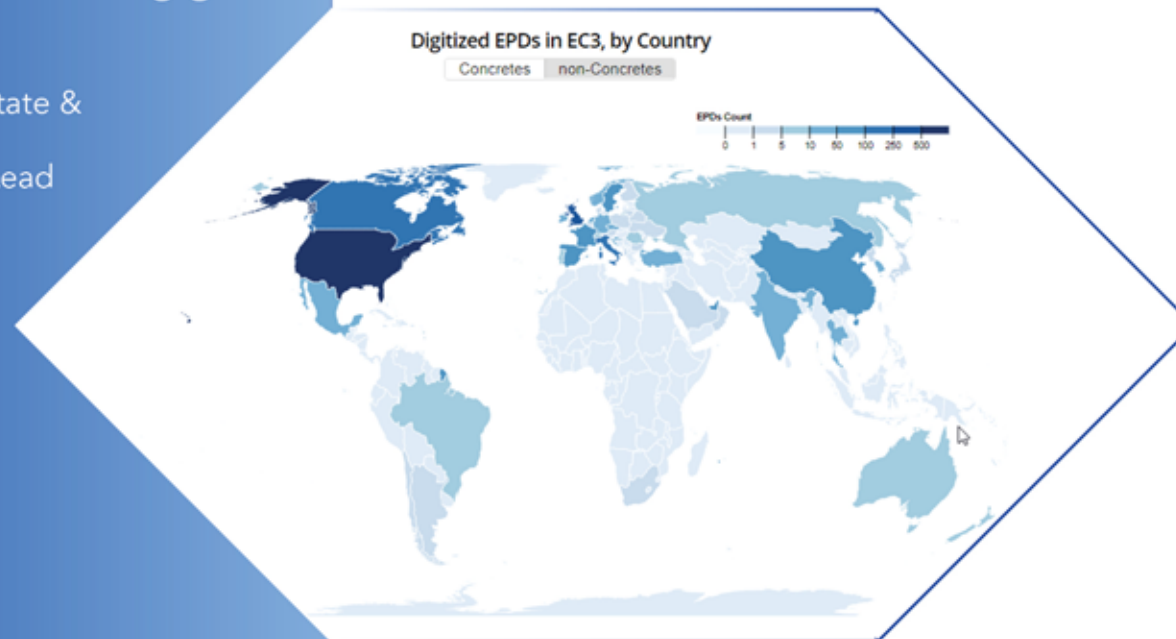
“Building on our investments in smart buildings and energy efficiency, our use of the tool enables us to take a data-driven approach to make decisions about construction with respect to carbon, selecting raw materials that reduce building embodied carbon emissions by as much as 30 percent.”

- Katie Ross  
Global Real Estate & Facilities  
Sustainability Lead  
Microsoft

The [Embodied Carbon in Construction Calculator \(EC3\)](#), a tool that allows project-level benchmarking, assessment and reductions in supply chain CO2 emissions of construction materials, continues to garner industry support.

As of December 2020, the tool is powered by over 46,000 digitized Environmental Product Declarations from 1139 plants owned by 431 different manufacturers on every continent except Antarctica. More than 10,600 users have signed up, a number that is growing by 200 new users weekly.

Microsoft was the first large corporate user of the EC3 tool that helped the technology giant track the carbon emissions of raw building materials in their Campus Modernization Project.



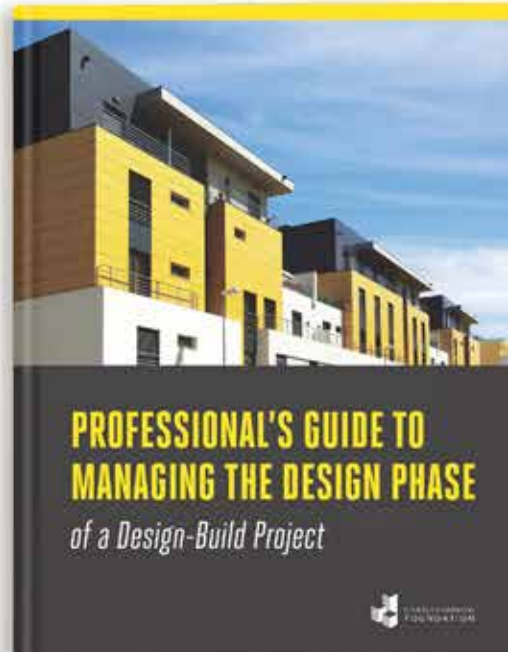


## Resources to Help Managers of Design-Build Projects

“This guide is a handbook for design-phase managers: Practical suggestions — distilled from the experiences of facility owners, developers, and senior design and construction practitioners — and proven procedures that can be applied to the situation at hand. While the guide is intended for design-phase managers in design-build organizations, the principles in this guide may be broadly applied to other project delivery methods.”

- From Professional's Guide to Managing the Design Phase of a Design Build Project

And finally, the Foundation's iconic publication, [Professional's Guide to Managing the Design Phase of a Design Build Project](#), became available for free in 2020. Since 2011 when the first version was published, the Guide has served as a foundational resource in universities and corporate learning programs, fostering a professional workforce to deliver projects collaboratively, on time and under budget. An update of this Guide is planned for 2021.



# LEADERSHIP TEAM

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**Richard M. Kunnath P.E.,**  
Board President



**Timothy P. Murphy, Esq.,**  
Board Secretary &  
Chief Financial Officer



**Ron Klemencic**  
**P.E., S.E., Hon. A.I.A.**  
Board Director

**Greg Gidez, A.I.A. FDBIA**  
Board Director

**Glenn Bell, P.E., S.E.,**  
**CEng, F.SEI, F.ASCE, FIStructE**  
Board Director

**Anne Ellis, P.E., F.ACI, F.ASCE**  
Executive Director





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