CIR Advisory Panel Meeting – Spring 2025

CIR | CENTER FOR Infrastructure Renewal

12:00 pm	Opening Remarks & Introductions	Mr. Greg Baker CAP Chair	Ms. Lisa Lukefahr CAP Vice Chair
12:05 pm	CIR Newsletter & Research Revenues	Dr. Anand Puppala CIR Director	
12:10 pm	TTI Revenues & Project Highlights	Dr. Edith Arámbula-Mercado CIR Deputy Director	
12:15 pm	Center Research Highlight	Dr. Chenglin Wu Associate Professor - Texas A&M University, Civil & Environmental Engineering)	
12:25 pm	Center Research Highlight	Dr. Kinsey Skillen Assistant Professor - Texas A&M University, Civil & Environmental Engineering	
12:35 pm	CAP Member Spotlight	Mr. Rob Van Til Knife River, Executive Vice President, Central Region	
12:45 pm	CAP Member Discussion	Mr. Greg Baker CAP Chair	Ms. Lisa Lukefahr CAP Vice Chair
12:58 pm	Fall Meeting Updates	Mrs. Pamela Mize CIR Program Specialist	
1:00 pm	Meeting Adjourn	Mrs. Pamela Mize CIR Program Specialist	

The meeting will begin at 12:00pm. Thank you for joining us today!

Please utilize the chat to submit any questions and/or comments during the meeting.

The moderator will ensure that all submitted questions/comments are received by CAP leadership.

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Texas A&M Transportation Institute

TEES | Texas A&M Engineering Experiment Station

CIR Advisory Panel Meeting Spring 2025

Thursday, April 24, 2025 | 12:00 pm to 1:00 pm

Lower Cost | Less Time | Longer Life

Opening Remarks & Introductions

Mr. Greg Baker
CIR Advisory Panel Chair

Ms. Lisa Lukefahr
CIR Advisory Panel Vice Chair

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CIR Newsletter & TEES Research Revenue

Dr. Anand Puppala

CIR Director

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CIR Newsletter – Fall 2024

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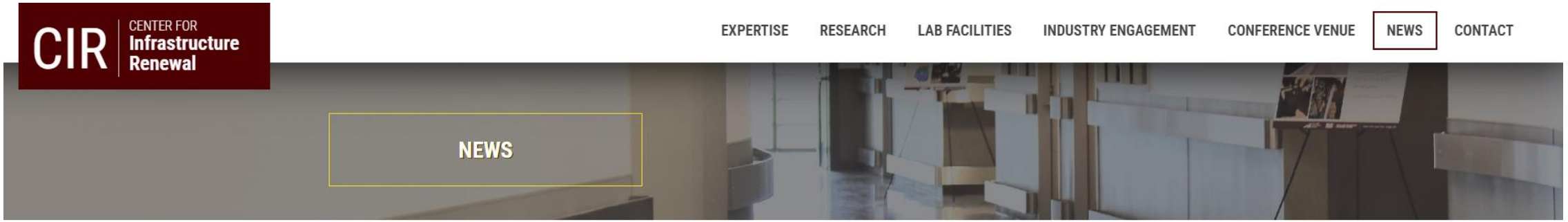
CIR.TAMU.EDU/NEWS



Read Newsletter

RECENT NEWSLETTERS

Fall 2024 Newsletter

Spring 2024 Newsletter

Please send all news related updates to Katie Carroll katiecarroll@tamu.edu

In the News

New Research Aims to Protect Aging Dams and Levees

CENTER FOR INFRASTRUCTURE RENEWAL

A $1.2M grant funds Texas A&M research to explore innovative solutions for enhancing aging dam and levee resilience to overtopping.Read more

New Research Aims to Improve Bridge Construction in Texas

CENTER FOR INFRASTRUCTURE RENEWAL

Dr. Kinsey Skillen leads a new 42-month TxDOT research project at the Center for Infrastructure Renewal.Read more

CENTER FOR INFRASTRUCTURE RENEWAL

NEWSLETTER

FALL 2024

As we conclude the Fall 2024 semester, I want to recognize and thank the CIR faculty, staff, and students for their hard work and contributions over the past few months. From advancing research in areas such as sustainable materials and infrastructure innovation to supporting student growth and collaboration, your efforts are central to the success of our mission. These achievements reflect the steady commitment of our community to addressing infrastructure challenges with practical, forward-thinking solutions.

This semester has brought many noteworthy activities and milestones, including participation in national conferences, recognition through various awards, and progress in key research projects. These accomplishments highlight the value of our collective work and the importance of collaboration within and beyond the CIR. Thank you all for your dedication, and I look forward to what we will achieve in 2025. Here's to a successful year ahead!

Best regards,

Edith Arámbula Mercado

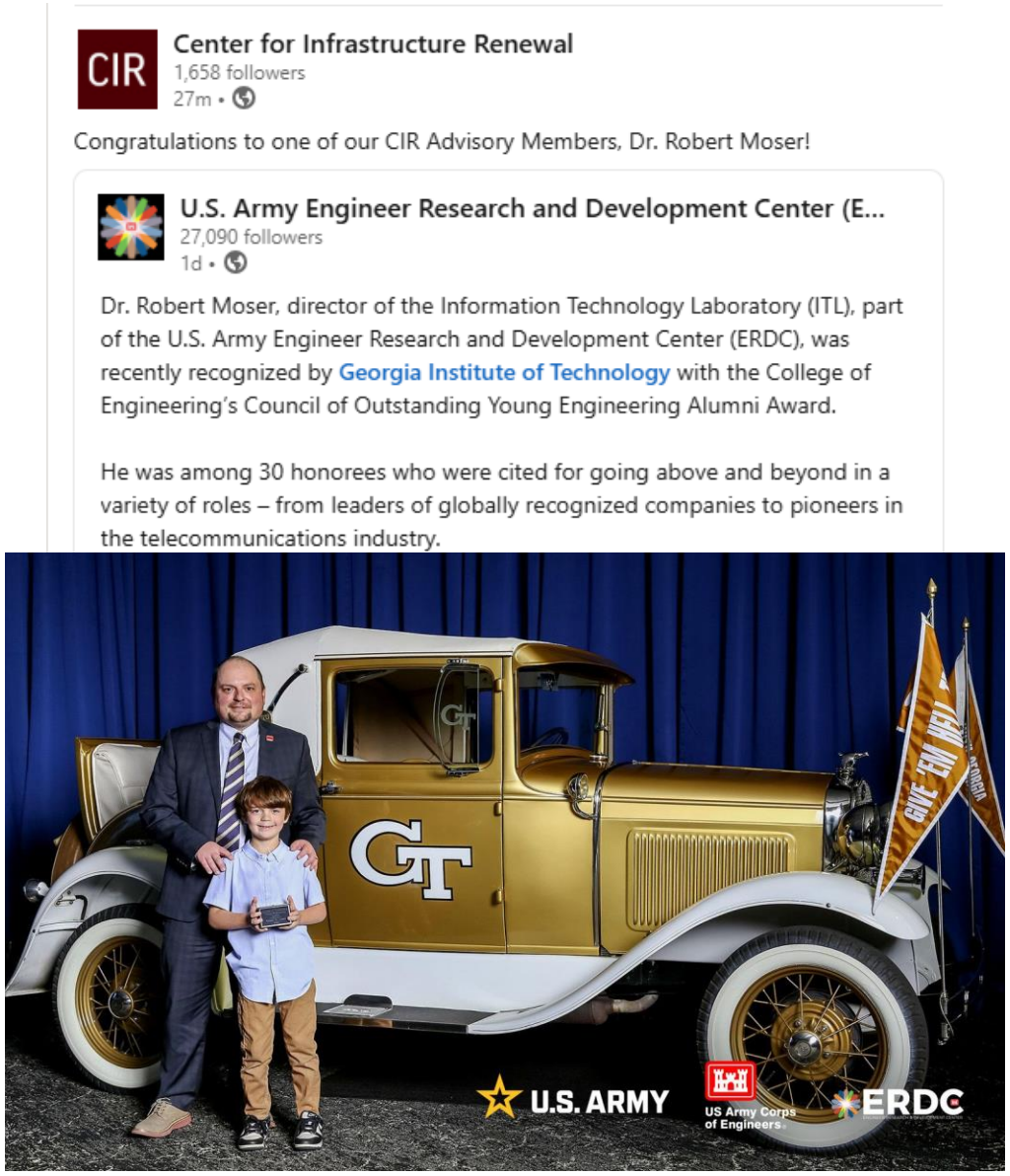
Dr. Edith Arámbula Mercado

Deputy Director, CIR

CIR Newsletter (Fall 2024) & LinkedIn

CIR | CENTER FOR Infrastructure Renewal

- 2 news items per month
- LinkedIn updates & posts
- CIR Board Member Highlights
  - Katie Carroll katiecarroll@tamu.edu
  - We want to share your awards, recognitions, promotions, achievements, honors, milestones, celebrations, etc!



TEES-CIR Research Data

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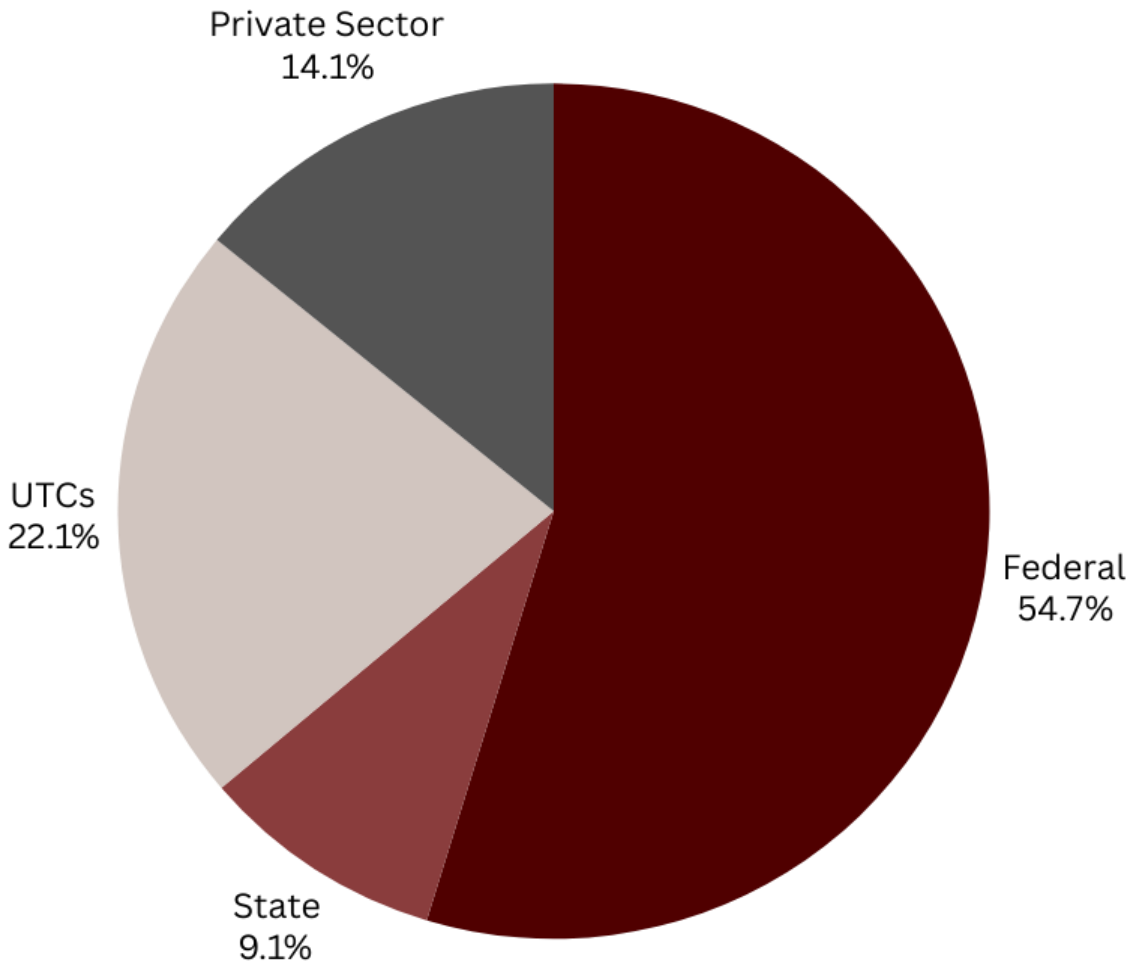
Partial FY 25 (Sept 24 – Feb 25)

- 10+ Multi-Million Dollar Infrastructure Grants
- Proposal Submission & Funding > $47M*
- Proposals Awarded ~ 3.6M*
- Research Expenditures from TEES CIR > $3.3M*

All numbers indicate we will exceed FY24 Numbers



TTI Revenues & Project Highlights

Dr. Edith Arámbula-Mercado

CIR Deputy Director

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TTI-CIR Revenue Sources

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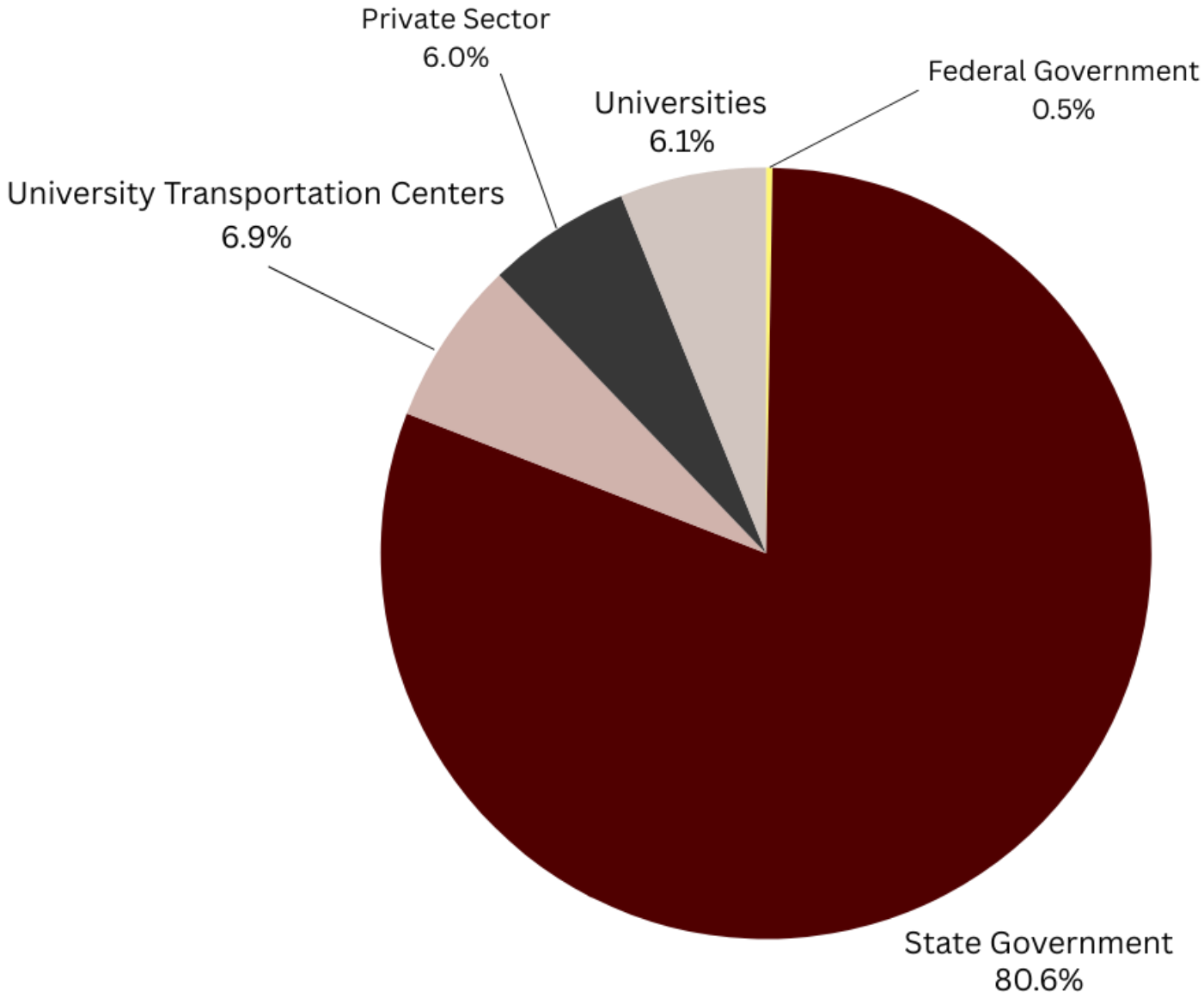
Total Budget $33.4M

Partial FY 25 (Sept 24 – Mar 25)

Est. CIR Expenses $2.7M



TTI Project Highlight

CIR | CENTER FOR Infrastructure Renewal

Carl Bierman, PE

TTI Assistant Research Engineer

Flexible Pavements

"FDR Mix Designs for Contingency Pavement Reconstruction"

U.S. Army Engineer Research and Development Center (ERDC)

FDR Mix Designs for Contingency Pavement Reconstruction

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- The U.S. Department of Defense possesses many airfield pavements in remote locations that
  A. Have deteriorated significantly or
  B. Have received minimal maintenance
- In contingency scenarios, it is logistically challenging to construct new infrastructure or perform major rehabilitation
- There is an increasing interest to evaluate the Full Depth Reclamation technique for rehabilitation of austere airfield pavements

Key Aspects of FDR Rehabilitation for Airfield Pavements in Remote Locations

- Time sensitive
- Sustainable/ Recycling
- Transportable
- Stage Construction
- Structural Contribution

Credit: U.S. Army Corps of Engineers. ERDC

FDR Material Testing at CIR

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Test Plan:

- Develop a catalog for quick selection of stabilizing agents and proportioning during expedient FDR pavement rehabilitation in remote locations.

- Collect 15 different FDR materials with material properties such as:
  1. Asphalt material properties and conditions
  2. Asphalt layer thicknesses
  3. Base material type and quality
  4. Base layer thickness

- Evaluate different stabilizing agents:
  - Portland cement and
  - Asphalt emulsion

Credit: U.S. Army Corps of Engineers. ERDC

FDR Material Testing at CIR

CIR | CENTER FOR Infrastructure Renewal

FDR mix designs are underway at the CIR materials lab. 15 mixes have been prepared, and each are treated with:

- 5% Cement
- 3% Emulsion, 2% Cement
- 4% Emulsion, 1% Cement
- 5% Emulsion

Tests include:

- Indirect Tensile Strength
- Unconfined Compressive Strength
- Moisture-Density verification

Project will be completed in February 2026

CIR Research Highlight

Dr. Chenglin Wu

Associate Professor – TAMU Civil & Environmental Engineering

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From Nano to Macro: Materials for Extreme Loads and Intelligent Machines

Dr. Chenglin Wu- PhD

Associate Professor

Zachry Department of Civil Engineering

Texas A&M University

Nano-material family

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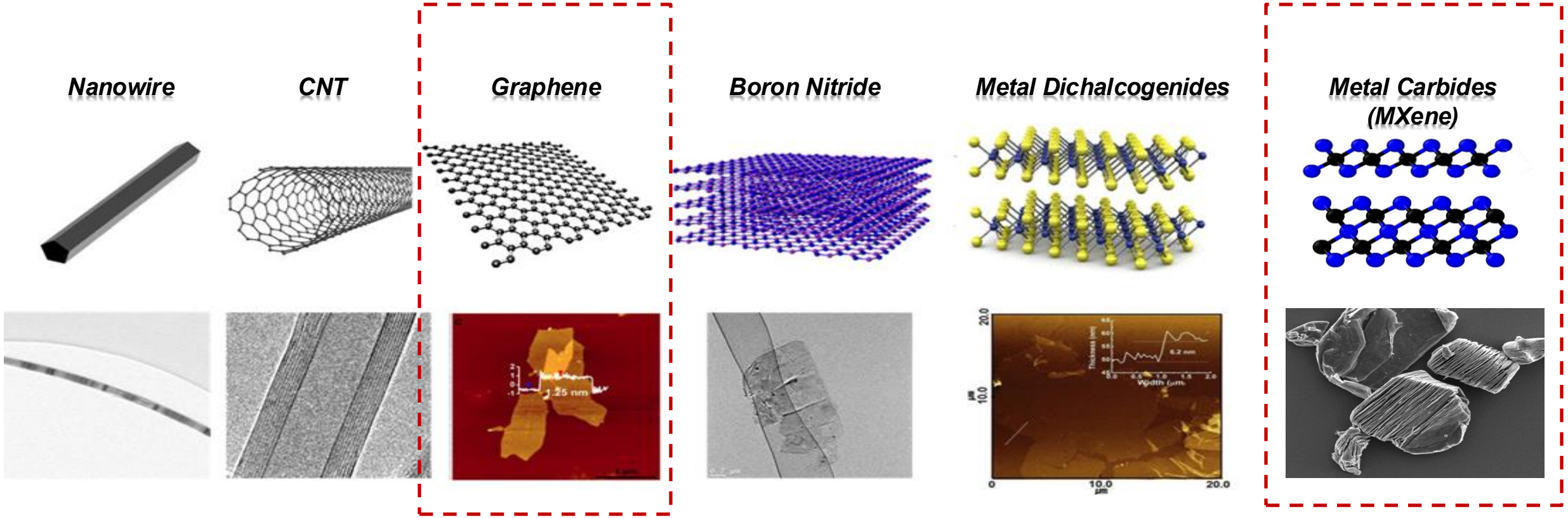

Features: large surface area, high mechanical strength and flexibility, and high reactivity, super light weight.

Applications: photovoltaics, semiconductors, electrodes and multi-functional nanocomposites and more.

Market Potential: US $390 Million by 2030 (Wikipedia)

2D-3D Ultra-high temperature ceramic composites

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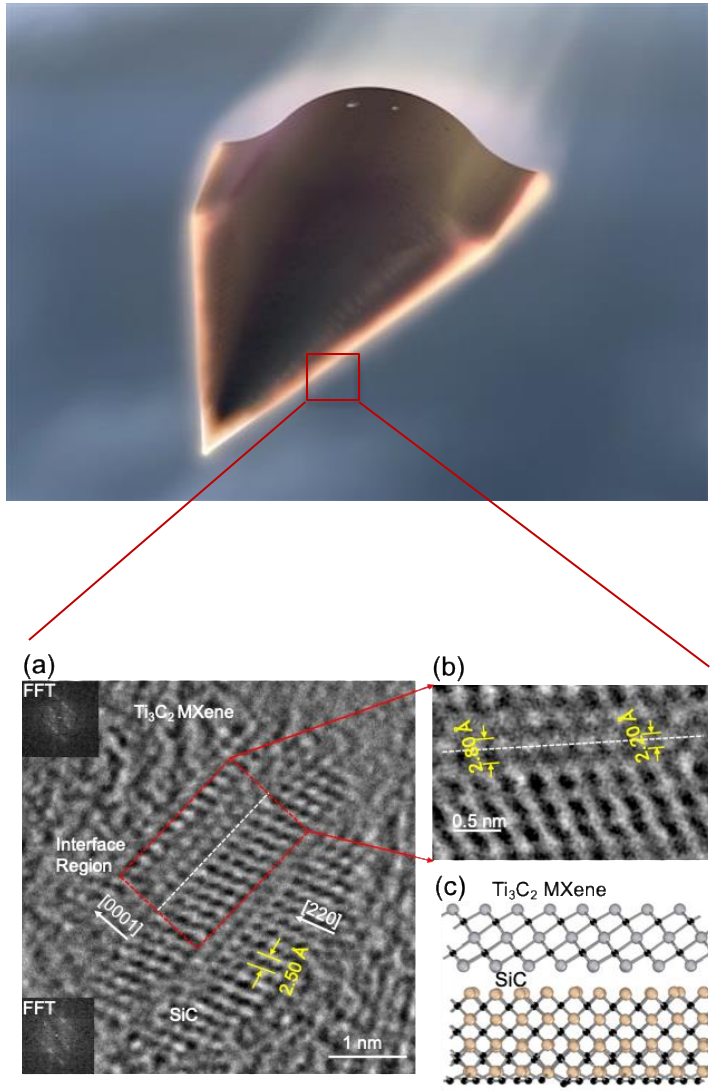

Goal: Establish systematic knowledge of toughening mechanisms in pyrolyzed-sintered ceramics that are heterogeneous by design across multiple length scales.

Material System

Particle ceramic (non-PDC)

Nanofiller reinforced PDC

Processing-Microstructure

Atomistic simulation

Initial state

Partial crystallization

Artificial Intelligence

Input Hidden layers Output

Length scale: nanometer to microns

Experimental validation/calibration

XPS/XRD/TEM/SEM

Microstructure-Mechanics

Interface mechanics characterization

P/2 P/2 PDC

Particle ceramics L

High temperature testing

Test frame Induction coil Environmental chamber

Length scale: nanometer to microns

Characterization of synergy in toughness

$$I_{Syn} = \frac{\Delta P_{1+2}}{\Delta P_1 + \Delta P_2} - 1$$

Heterogeneity-Mechanics

Length scale: > 10s of microns

Data driven design of heterogeneous ceramics

E_1 E_2

CODE – Experimental validation

Material A inlet Material B inlet Active mixing blade Mixing chamber Mixture outlet (a)

Office of Naval Research ONR Science & Technology

Gan et al., 2025, In preparation

2D-3D Ultra-high temperature ceramic composites

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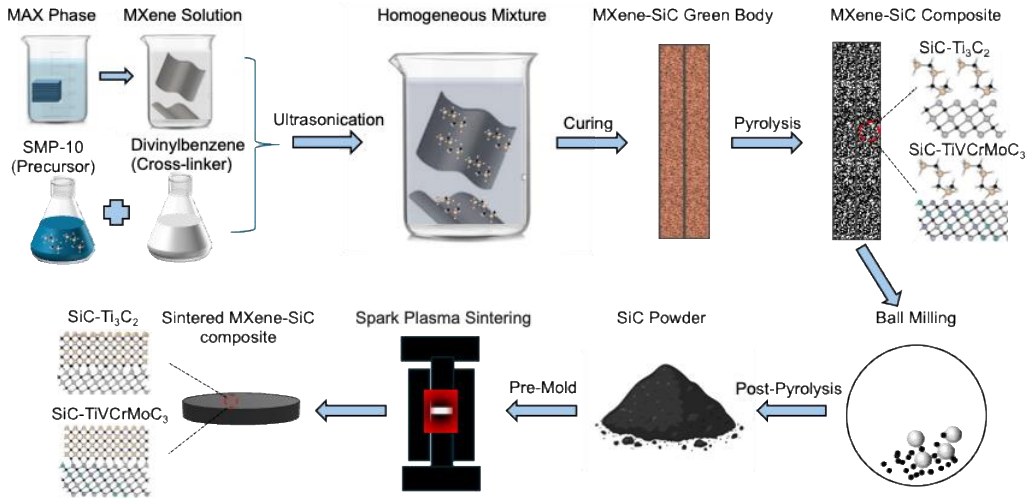
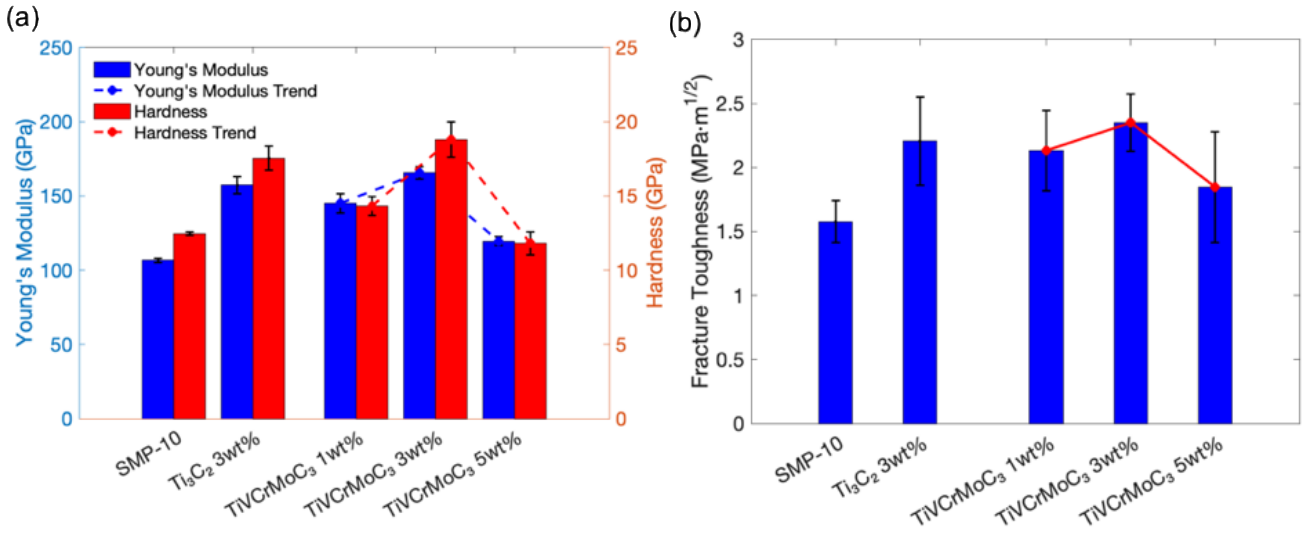
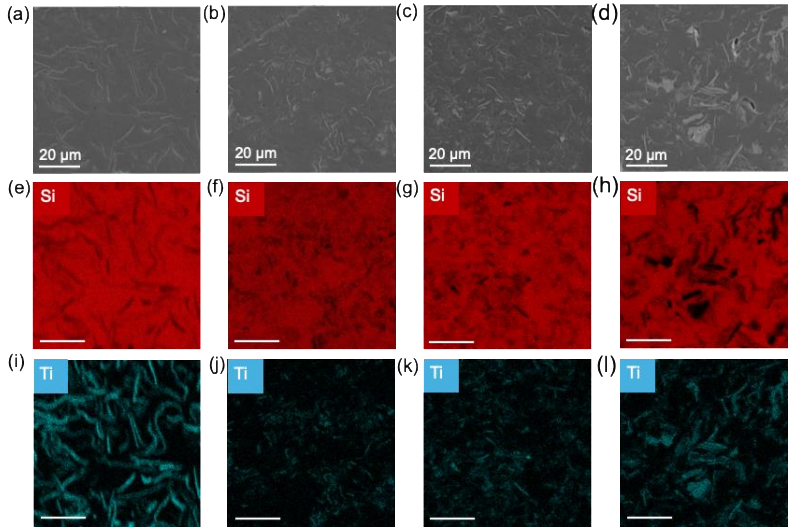
Fabrication of MXene-Reinforced Ceramic Composites



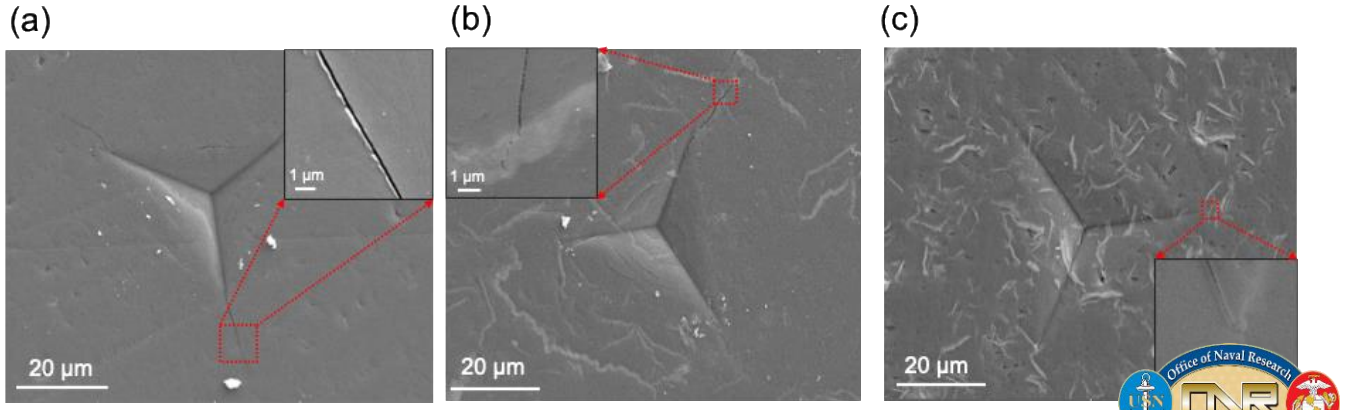
Young's Modulus & Hardness and Fracture Toughness



MXene Dispersion in Ceramic Composites



Crack Deflection in MXene Ceramic Composites



Sensor for human-robot collaboration

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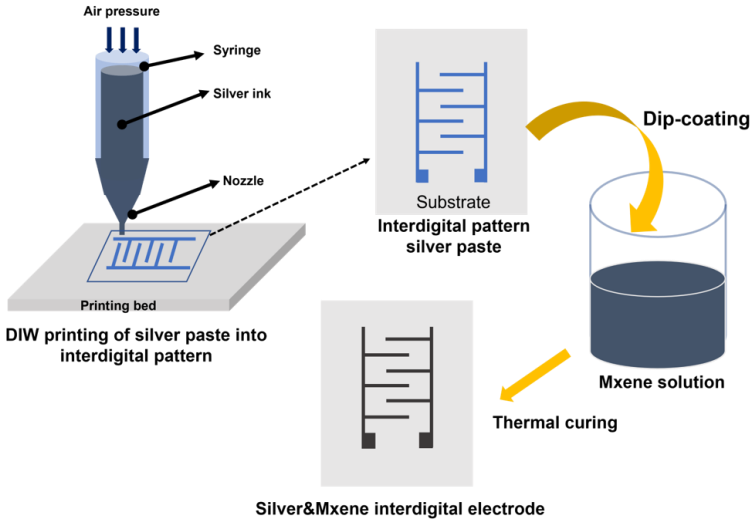
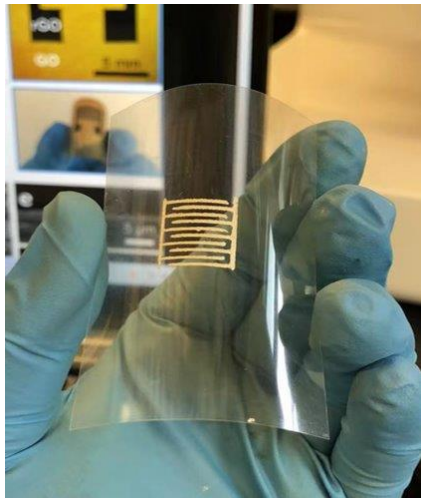
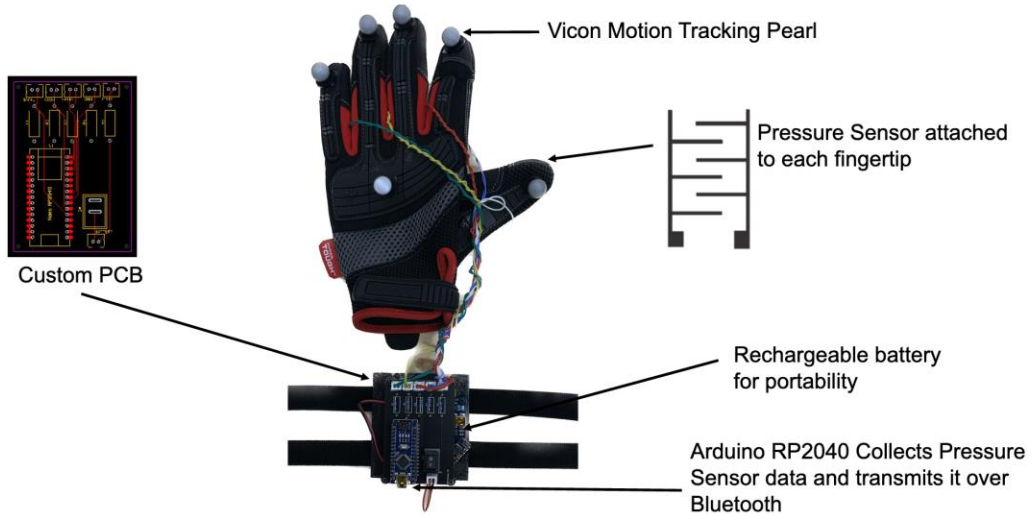
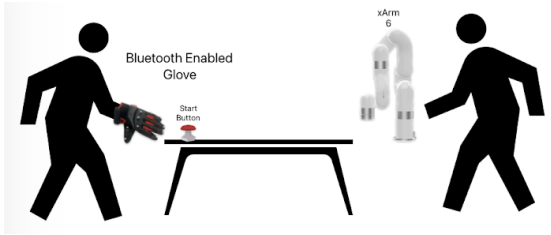


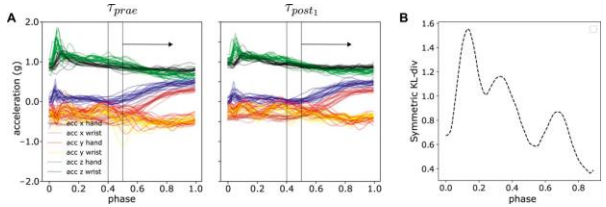


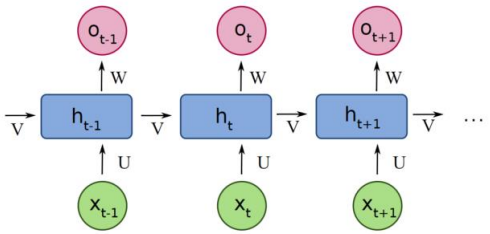


Data collection
Tele-robot operation

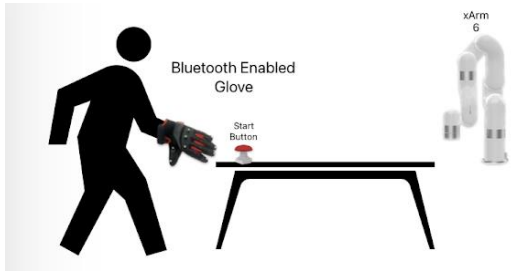


Probabilistic Motion Learning





Human-Robot Collaboration



NSF

Sensor for human-robot collaboration

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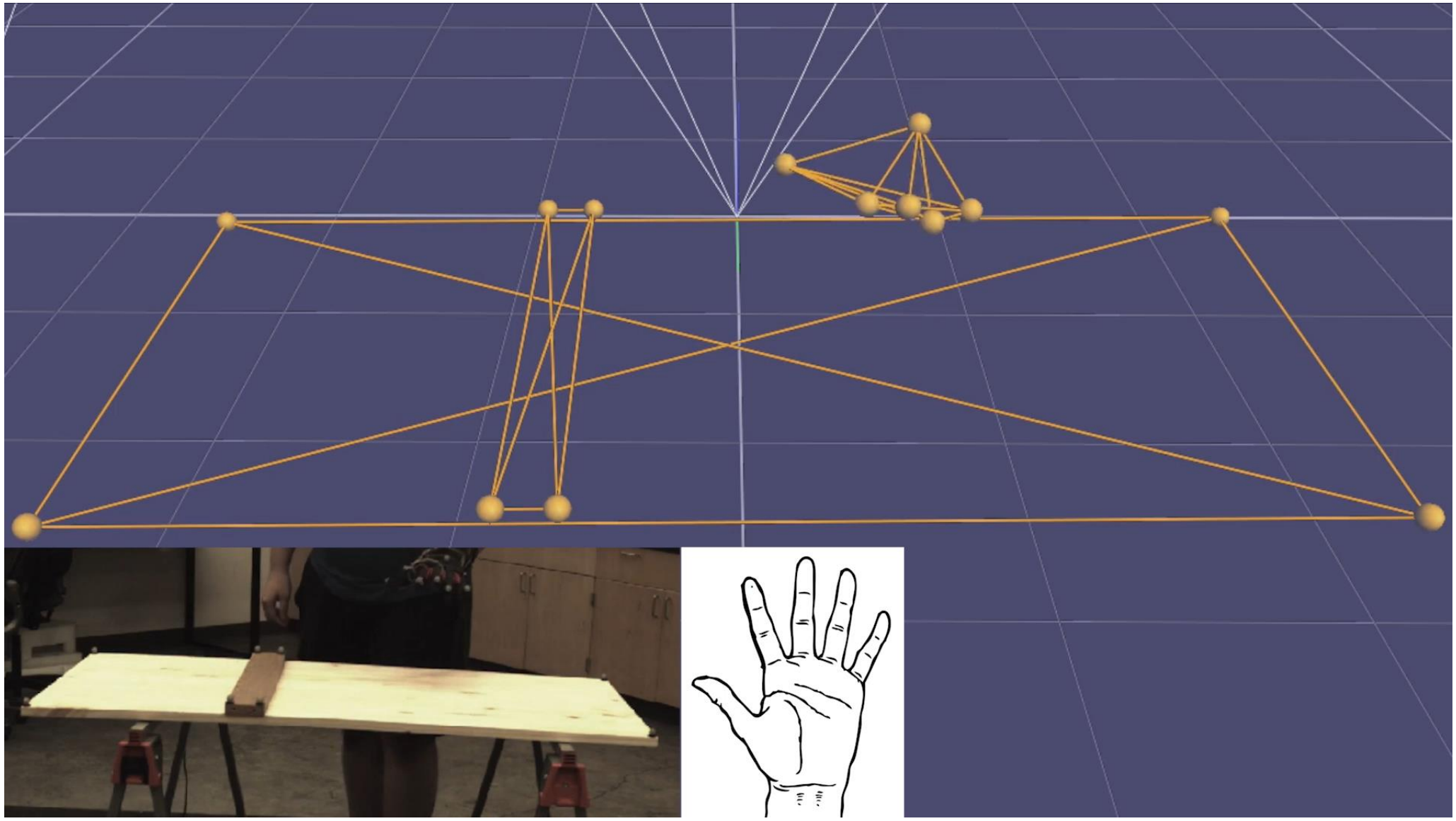

Sensor for human-robot collaboration

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NSF

GFRP Reinforced Bridge Barrier

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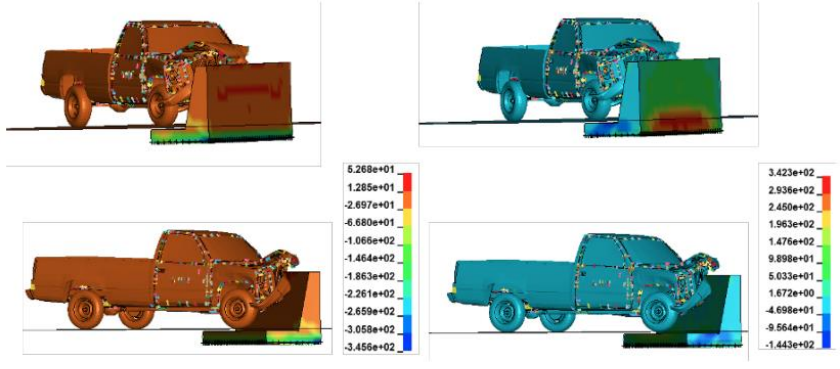

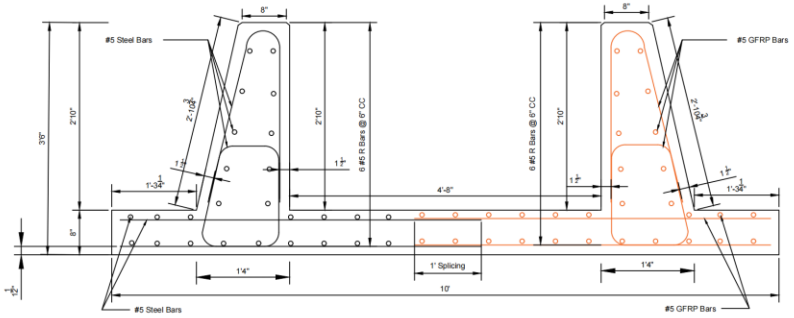

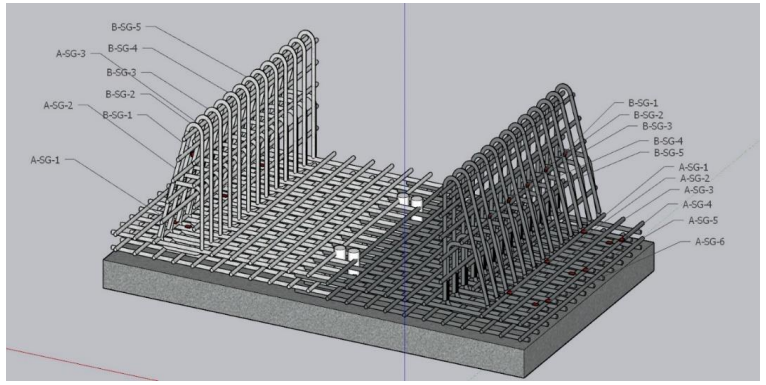

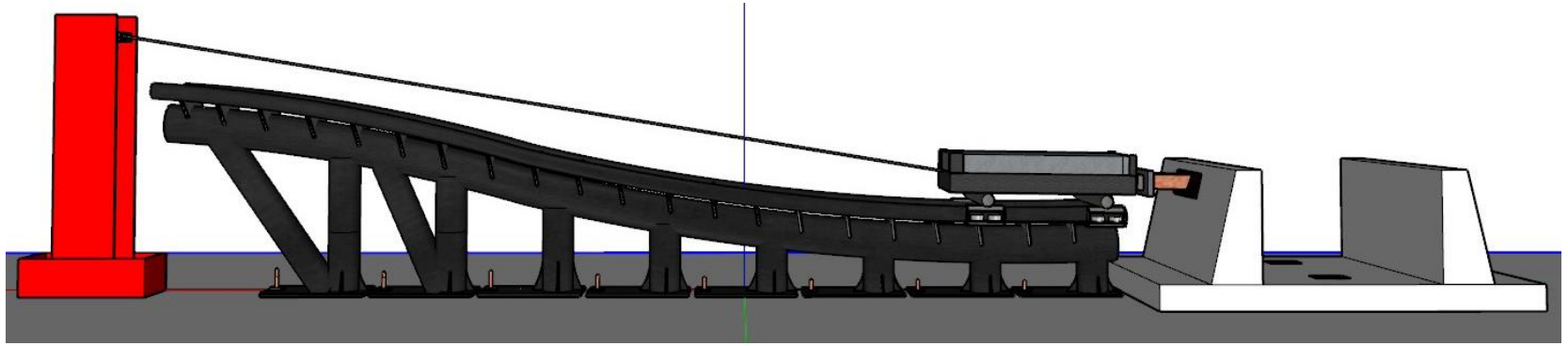

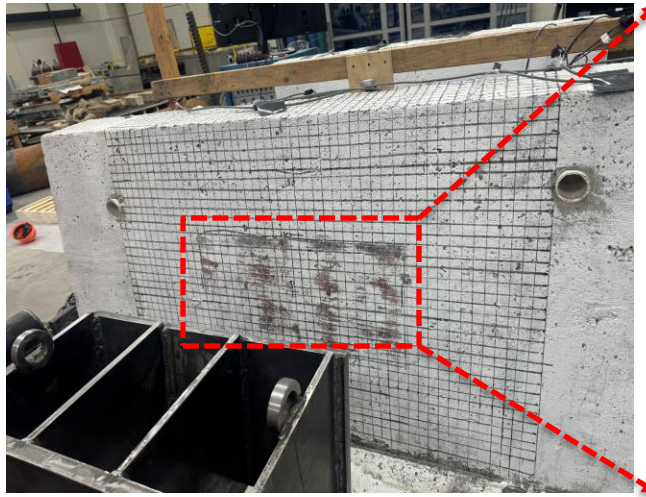

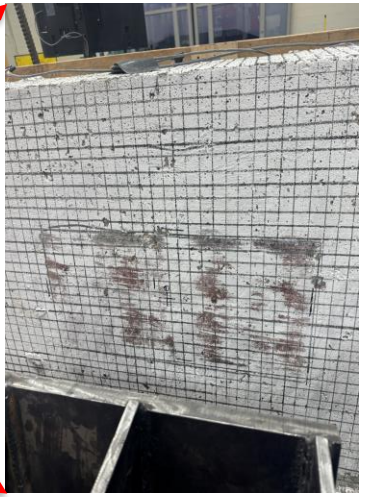

MID-AMERICA TRANSPORTATION CENTER

MoDOT

UTC 1987 2026

GFRP Reinforced Bridge Barrier

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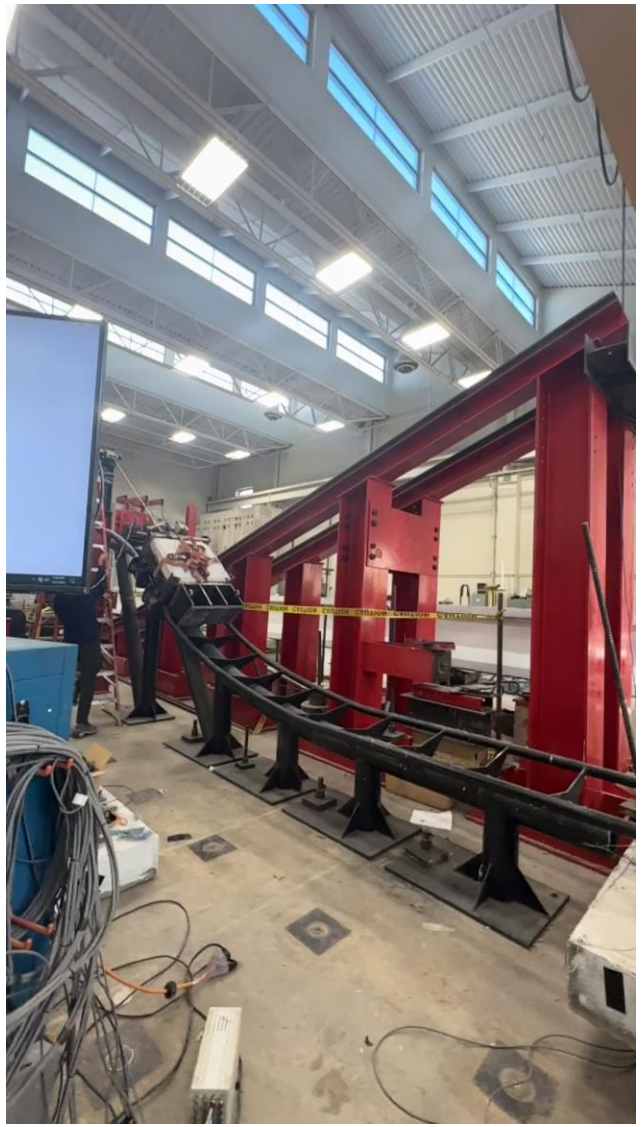

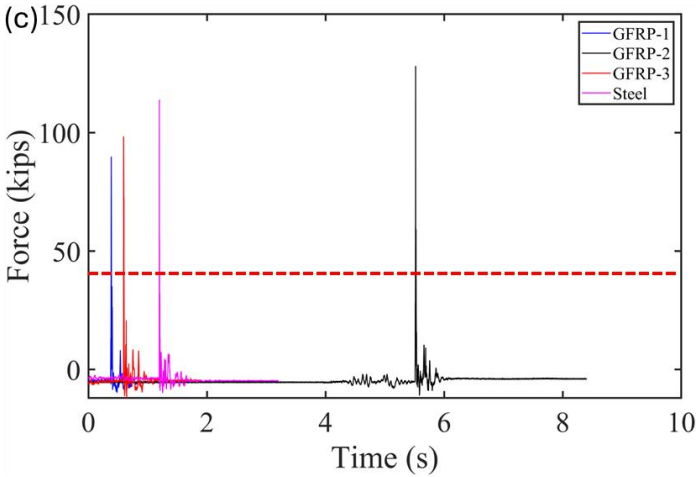

MID-AMERICA TRANSPORTATION CENTER

MoDOT

UTC 1987 2026

CIR Research Highlight

Dr. Kinsey Skillen

Assistant Professor – TAMU Civil & Environmental Engineering

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Texas A&M Transportation Institute

TxDOT Project 0-7155:
Define/Refine Design Provisions for Headed and Hooked Reinforcement

PI: Kinsey Skillen (TTI)
Sponsor: TxDOT
Amount Awarded: $999k

Texas Department of Transportation

Texas A&M Transportation Institute

TxDOT Project 0-7207

Determine Feasibility and Efficacy of Hollow Precast Straddle Bents

PI: Kinsey Skillen (TTI)

Sponsor: TxDOT

Amount Awarded: $1.29M

Texas Department of Transportation

Straddle Bents

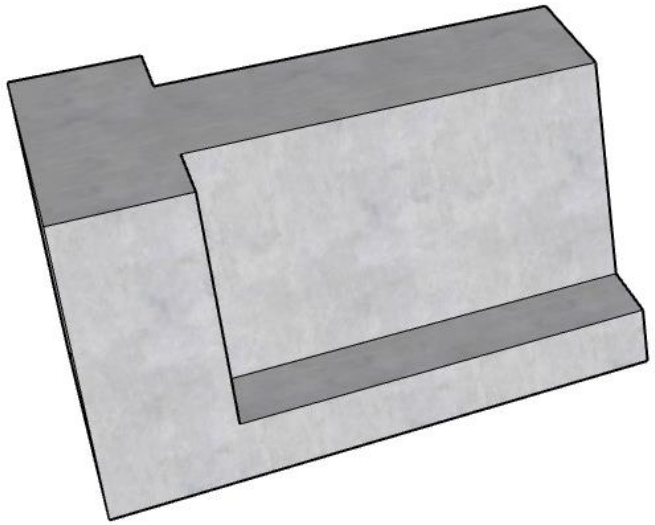
What? Cast-in-place Straddle

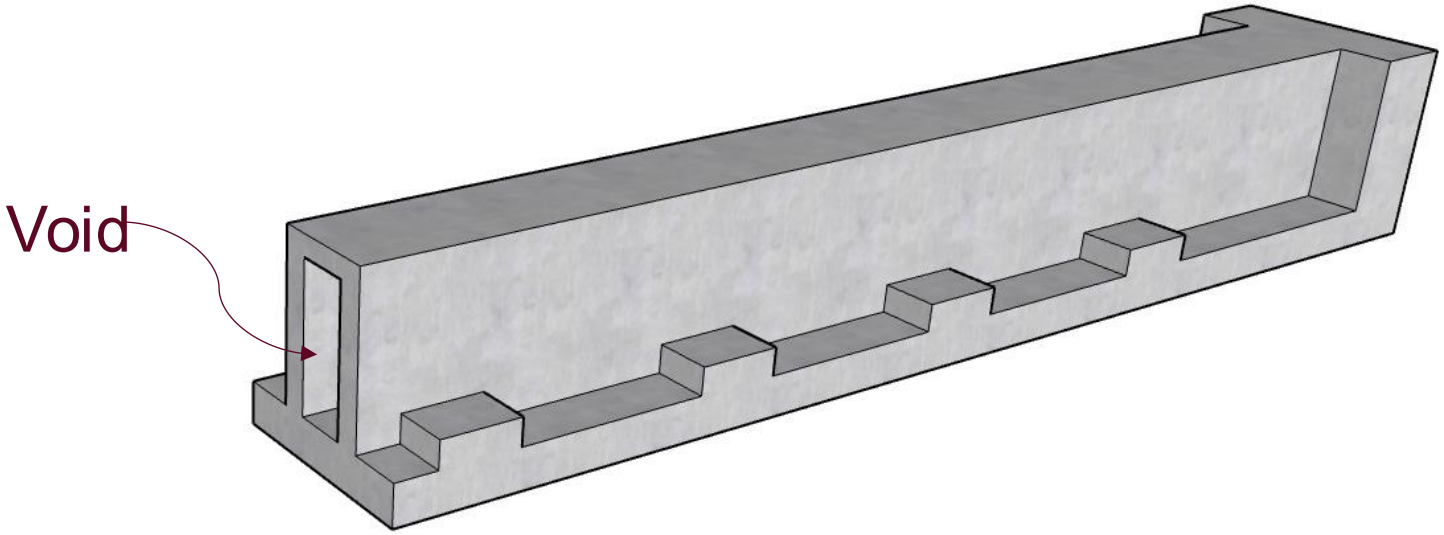
What? Post-Tensioned Straddle

What? Post-Tensioned Straddle

What? Hollow Prestressed Straddle

What? Hollow Prestressed Straddle

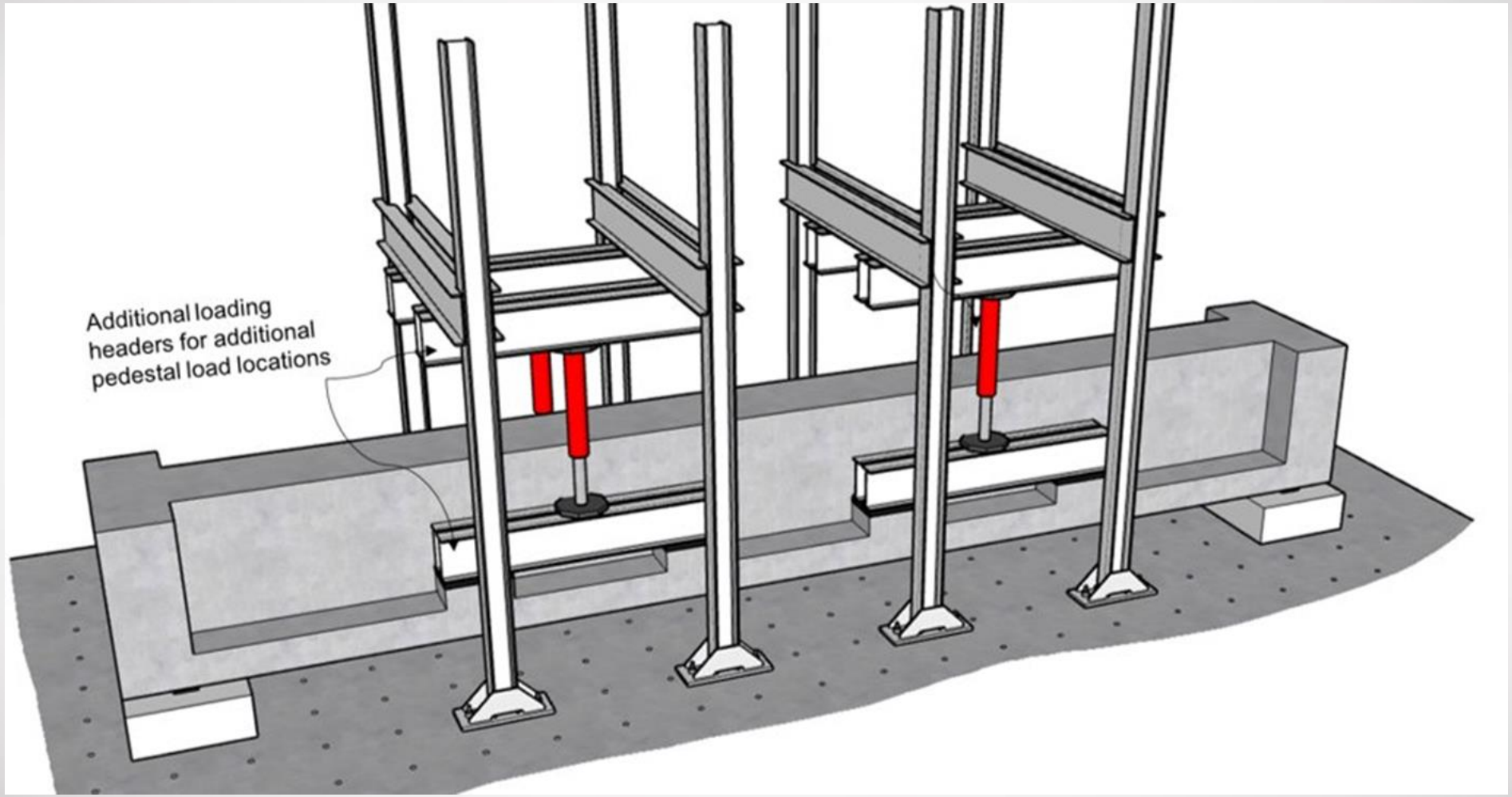




Why? Hollow Straddles in service

Why? Hollow Straddles in service

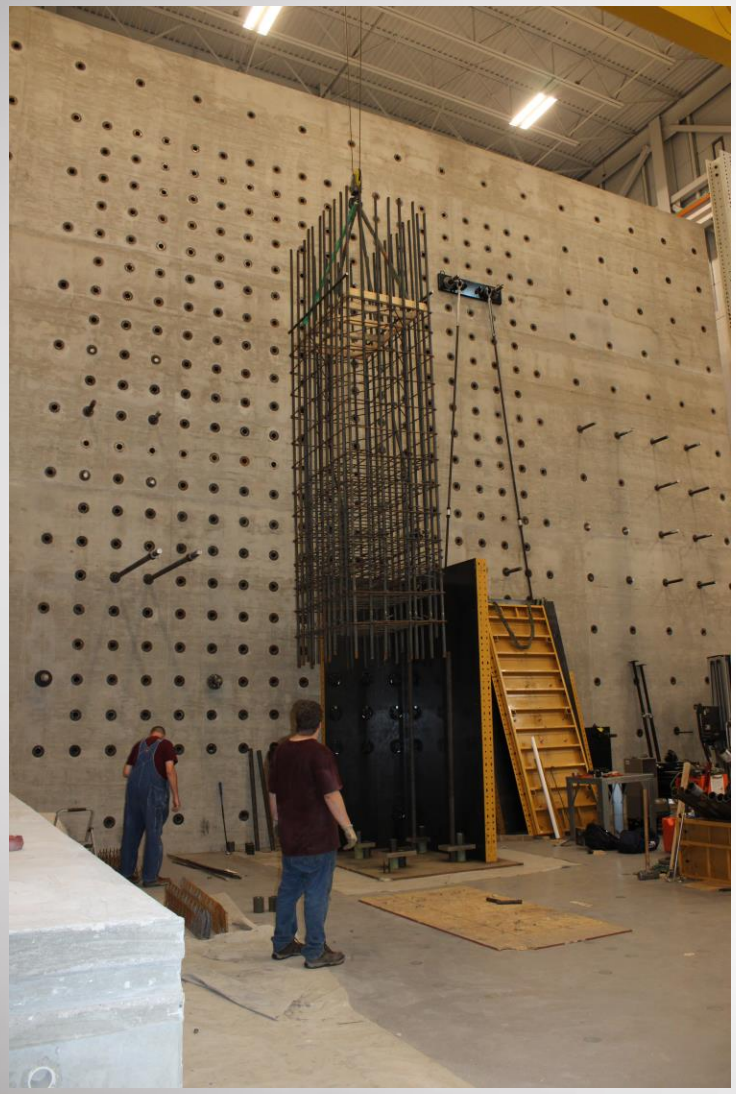
How? Laboratory Testing



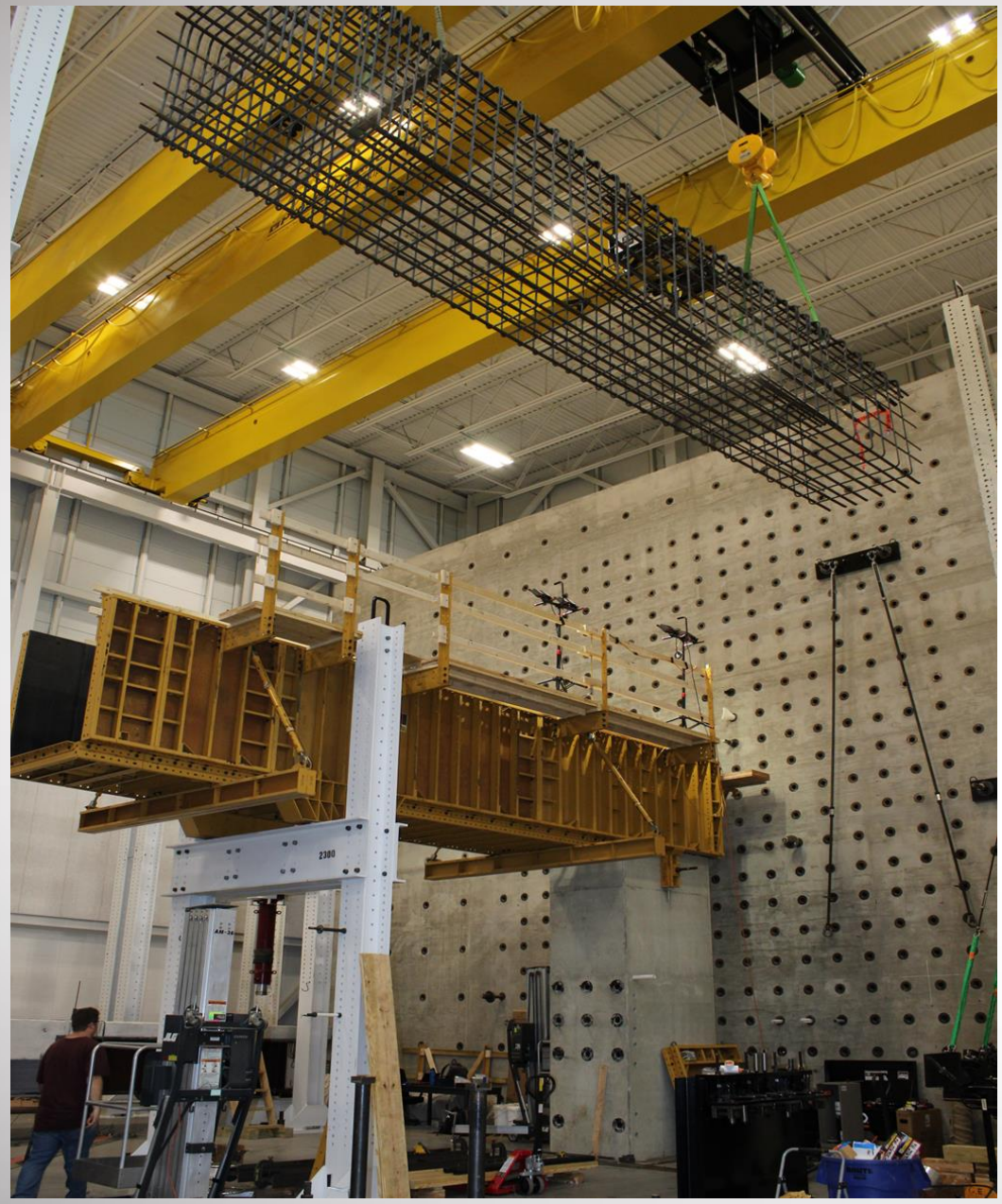
Why? Cast-in-place Straddle

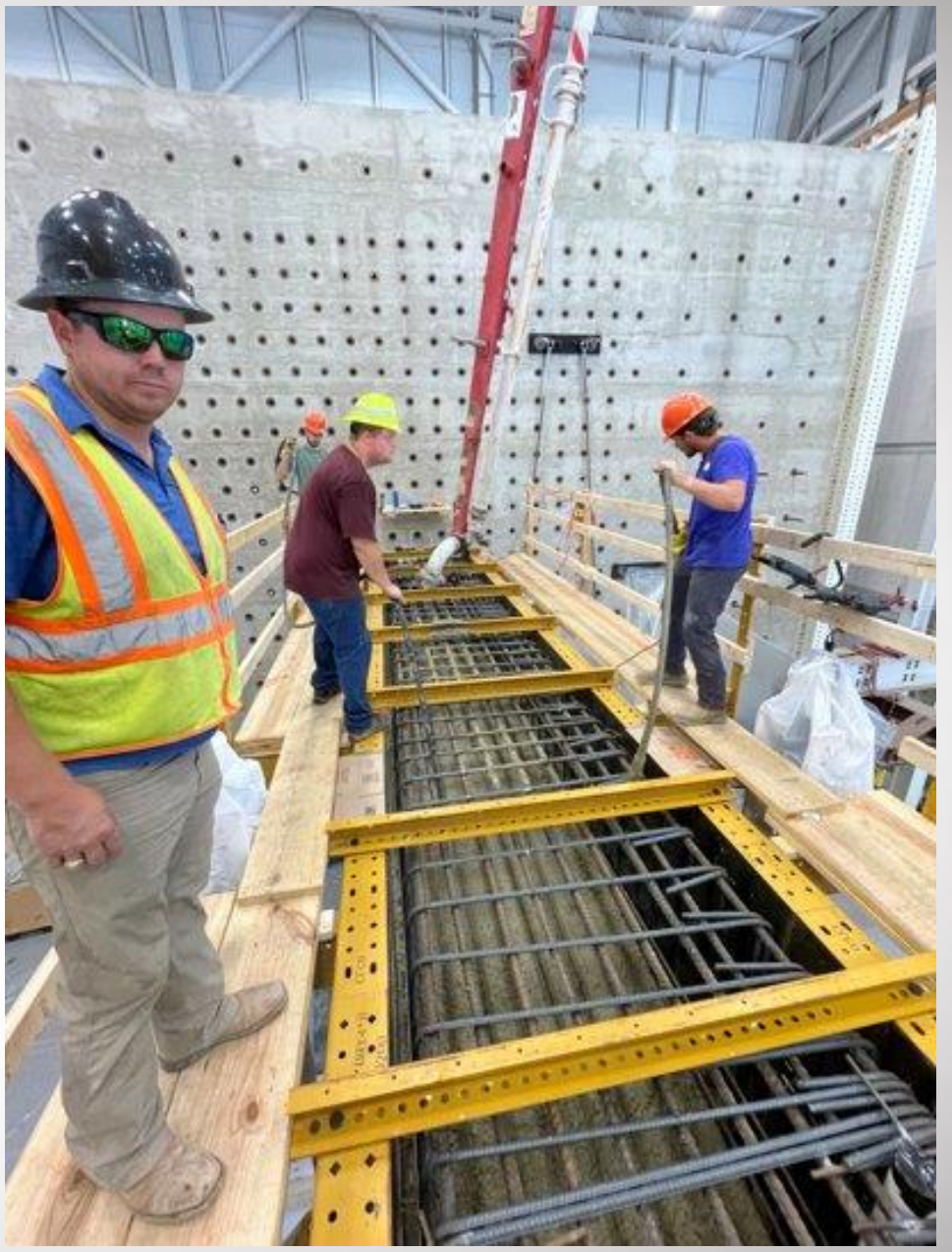
What? Cantilever Bents

How? Cantilever Bents



How? Cantilever Bent Lab Test






35
TON


Genie GS-1932
E-DRIVE


2300
2/21/2025
MTS LOAD: 50
DISP: 0.750
Genie GS-3232
Genie GS-1932


03/07/2025
MTS LOAD: 0
DISP: 12.75"
CIRTIME: 4:10 Step: 719
ENERPAC

Texas A&M Transportation Institute

Questions?

Kinsey Skillen (skillen@tamu.edu)

CAP Member Spotlight

Mr. Rob Van Til

Knife River – Executive Vice President, Central Region

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Lower Cost | Less Time | Longer Life

KNIFE RIVER® | KNF LISTED NYSE

Rob Van Til

April 24, 2025

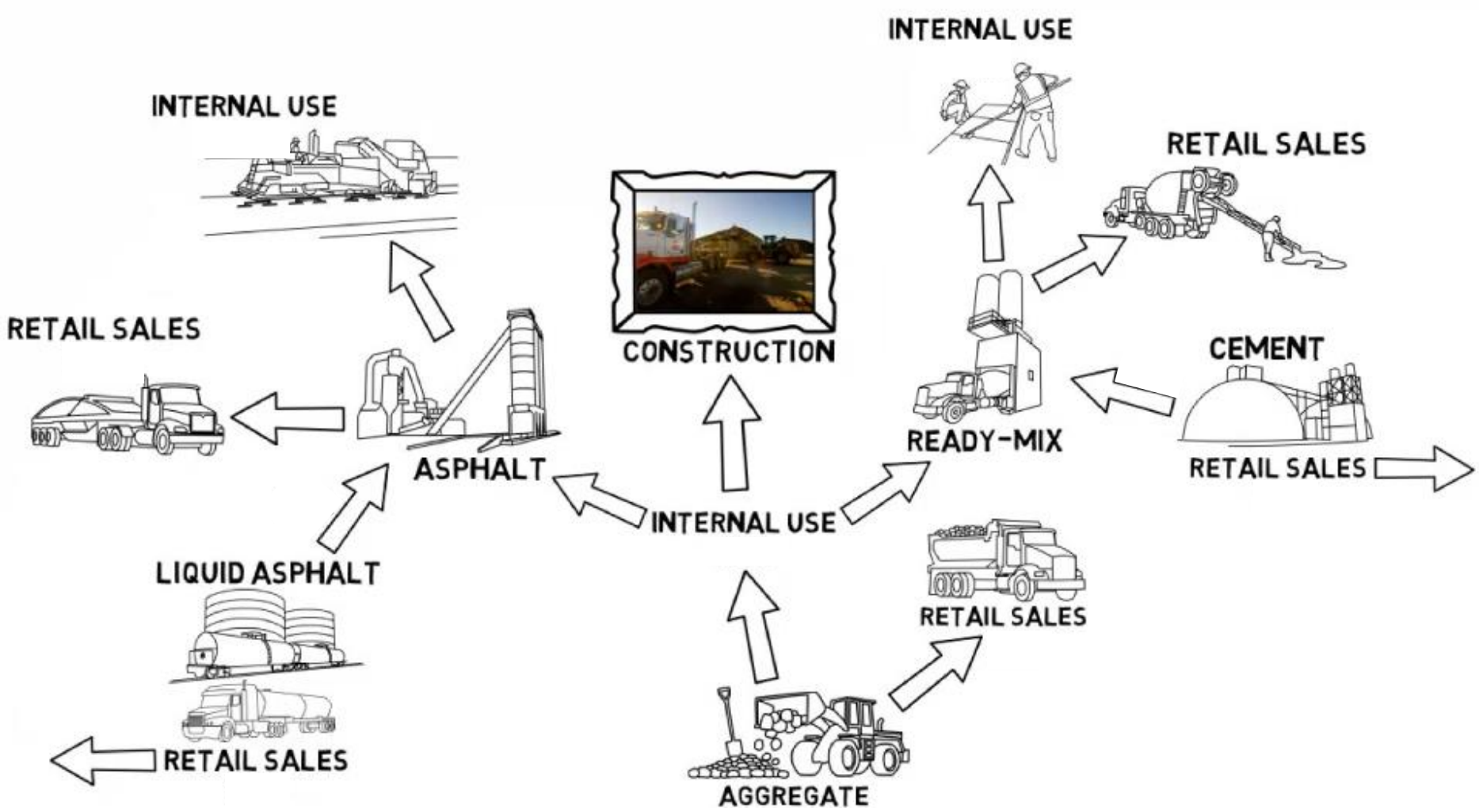
Who We Are and What We Do

- **Core Values**

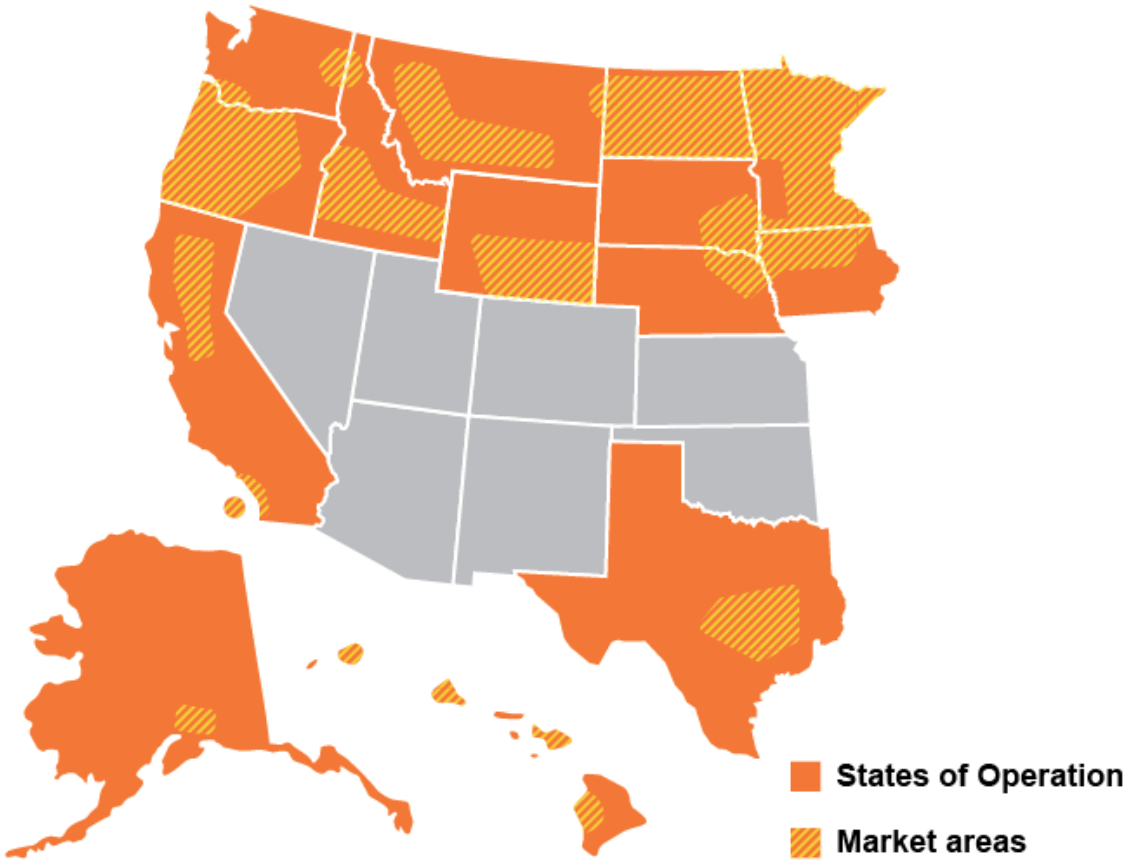
- **Product Lines**

Aggregates | Ready-Mix | Asphalt | Liquid Asphalt | Construction

Aggregates-Based, Vertically Integrated



Knife River Overview



- People-First Construction Company
- 6,000 Team Members (and growing!)
- 14 States
- 4th Largest US Aggregate Producer
- Vertically Integrated Construction Materials and Contracting Services

CAP Member Discussion

Mr. Greg Baker
CIR Advisory Panel Chair

Ms. Lisa Lukefahr
CIR Advisory Panel Vice Chair

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CAP Member Discussion

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- How do we work with CIR researchers and help in the student workforce development?
- Opportunities for research cost shares with UTC projects?
- Student Support & Internships
- Can we bring more industry members to CAP board who can help with CIR goals?

Fall CAP Meeting Updates

Mrs. Pamela Mize

CIR Program Specialist

CIR | CENTER FOR Infrastructure Renewal

Texas A&M Transportation Institute

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Experiment Station
Thank you for attending the Spring 2025 CIR Advisory Panel Meeting!