Overview of Pitt Transportation Infrastructure Research

-Brainstorming Session-

Julie Vandenbossche

December 2, 2021

Thank You!

PITT | IRISE - Denotes Founding Members

PITT | IRISE
ALLEGHENY COUNTY
ALWAYS INSPIRING

PITT | IRISE
PENNA TURN PIKE

PITT | IRISE
GOLDEN TRIANGLE CONSTRUCTION®
GENERAL CONTRACTORS

PITT | IRISE
pennsylvania
DEPARTMENT OF TRANSPORTATION

PITT | IRISE
Michael Baker
INTERNATIONAL

CAWP
Constructors Association of Western Pennsylvania

Welcome

CAWP Guests:

- Casper Colosimo and Sons
- Plum Contracting
- Eurovia
- Fay Company

Completed or Ongoing Pitt Research

Bridges

- Steel Bridge Corrosion Prevention and Mitigation Strategies, *Dr. Stephens*
- Corrosion Repair Strategies for Steel Girder Ends Using High Performance and Traditional Materials, *Dr. Harries*
- Data Management, Mining, and Inference for Bridge Monitoring, *Dr. Rizzo*

Completed or Ongoing Pitt Research

Bridges (cont.)

– Improving Bridge Assessment Through the Integration of Conventional Visual Inspection, Non-Destructive Evaluation and Structural Health Monitoring Data, *Dr. Alavi*

Pitt Bridge Condition Assessment System (PittBCAS)

Output delamination area

Output
- Crack region density
- Total crack length
- Crack density
- Spall region density

RUTGERS
Center for Advanced Infrastructure and Transportation

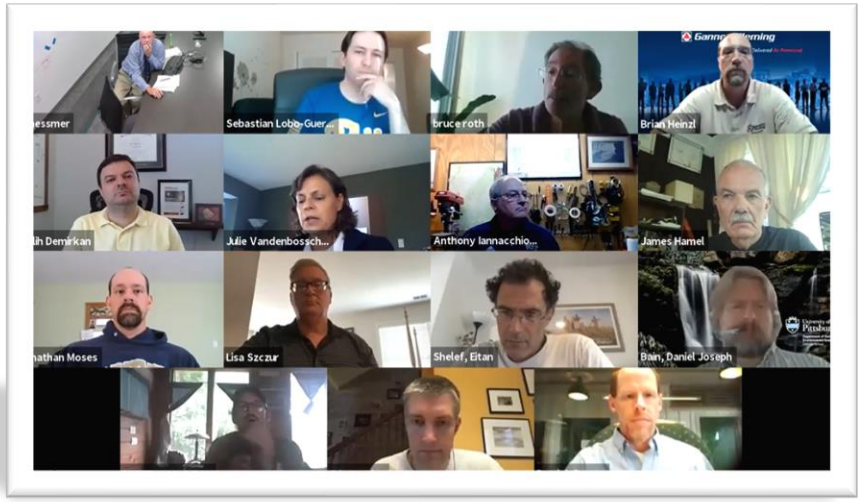
WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS
Wiss, Janney, Elstner Associates, Inc.

Completed or Ongoing Pitt Research

Geotechnical

- Exploring Approaches to Managing Landslide Risks: Workshop Summary Report, *Dr. Iannacchione*
- Landslide Capacity Building Seminars, *Drs. Iannacchione and Bain*
- Landslide Best Practices, *Dr. Ciloglu, MBI*
- Depth to Bedrock Seismic Measuring Device, *Dr. Sachs*

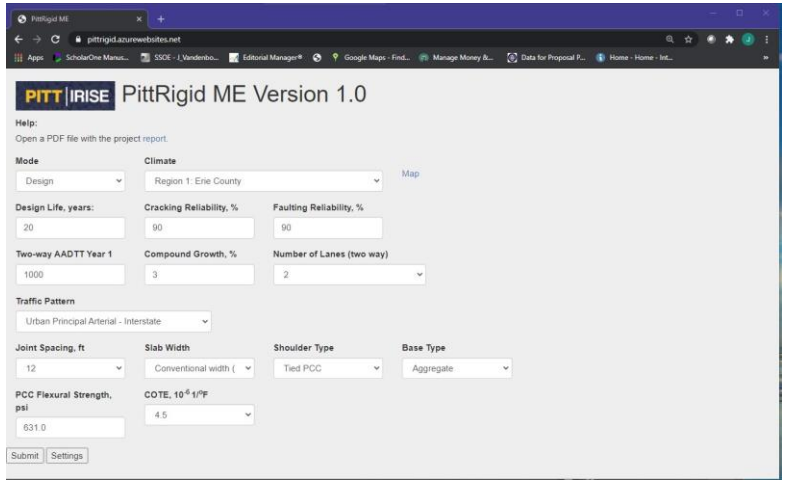
Best Practices MANUAL



Completed or Ongoing Pitt Research

Pavements

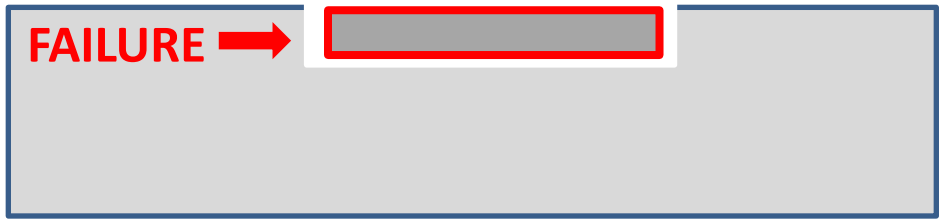
- Development of a Simplified Mechanistic-Empirical Design Tool for Rigid Pavements in PA, *Dr. Khazanovich*
- Faulting Models for JPCP and BOCA, *Dr. Khazanovich (JPCP) with (Dr. Vandenbossche (BCOA))*
- Super Load Effect on Pavement Life, *Dr. Vandenbossche*
- Early Opening of Concrete Pavements to Traffic, *Dr. Khazanovich*
- Preliminary Evaluation of Pavement Surface Distresses Related to Pavement Markings, *Dr. Khazanovich*



Completed or Ongoing Pitt Research

Materials

- Toward Using Microbes for Sustainable, *Drs Sachs and Haig*
- Carbon Nanotube Additives for Structural and Highway Concrete, *Drs Sachs and Gilbertson*
- Material Compatible Repairs for Concrete Pavements and Bridge Decks, *Dr. Sachs*



Completed or Ongoing Pitt Research

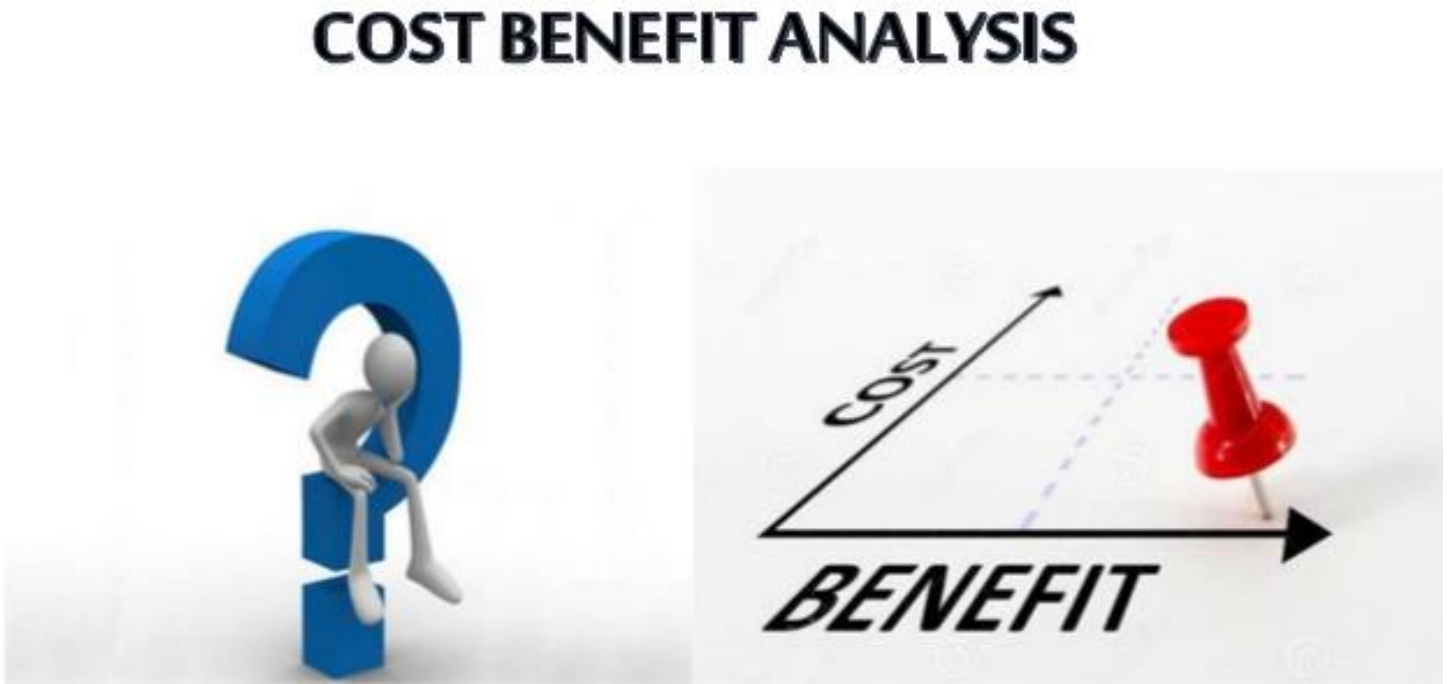
Worker Safety

– Remote Controlled Technology Assessment for Safer Pavement Construction and QA/QC, *Drs. Khazanovich*

Completed or Ongoing Pitt Research

Quantifying Value

- Developing Methodologies to Predict and Quantify the Benefits of IRISE Research, *Dr. Magalotti*



Projects Being Initiated

- Integrating Additive Manufacturing and Accelerated Bridge Construction Techniques
- Development of a Roadway Landslide Inventory and Analytical Tool for Southwestern Pennsylvania
- Three-dimensional Micro-mechanical Characterization of the Effect of Vibration and Compaction in Concrete Pavements
- Investigating New Underground Utility Location Technologies and Novel Methods to Improve the Safety and Efficiency of Highway Construction
- Identifying Major Causes of Construction Accidents for the Paving Industry in Pennsylvania
- Joint Performance Optimization for JPCP

Integrating Additive Manufacturing and Accelerated Bridge Construction Techniques

Problem: Need for new technologies that can:

- Increase construction quality of pre-fabricated bridge elements and systems
- Reduce construction time and labor cost
- Enhance safety and reliability
- Minimize environmental footprint of the PBES fabrication plants
- Enable in-situ repair of existing ABC elements via customizable design.

Objectives: Identify, fabricate and test of a range of 3D printable prefabricated bridge elements currently used in ABC projects.

- ❑ Dr. Alavi
- ❑ Duration: 24-months

Roadway Landslide Inventory and Analytical Tool

Problem:

- information about landslides is spread across multiple organizations
- Need accessible, comprehensive and consistent geophysical information
  - Guide mitigation efforts
  - Help identify most important causes and locations of most likely slopes to fail
  - Advance proactive approach to landslide monitoring and mitigation.

Objective: Design an inventory that amalgamates data from multiple agencies in a systematic and standardized format that addresses the needs of the interested agencies.

- ❑ Drs Bain, Iannacchione and Shelef
- ❑ Duration: 24-months

Effect of Vibration and Compaction in Concrete Pavements

Problem:

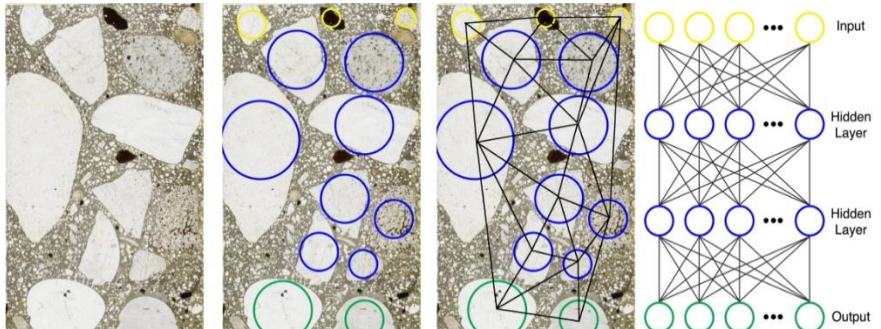
- Paving process affected by manipulations performed during construction (i.e., vibration and compaction)
- Established practices do not consider the specific conditions during paving on resulting product.

Objectives:

- Build novel experimental tools to enable optimized design and construction
- Experimentally investigate the effect of vibration and compaction under different environmental conditions
- Build and validate computational tools and identify best practices
- Create new guidelines

❑ Duration: 24-months

❑ Dr. Fascetti



Investigate New Underground Utility Location Technologies

Problem:

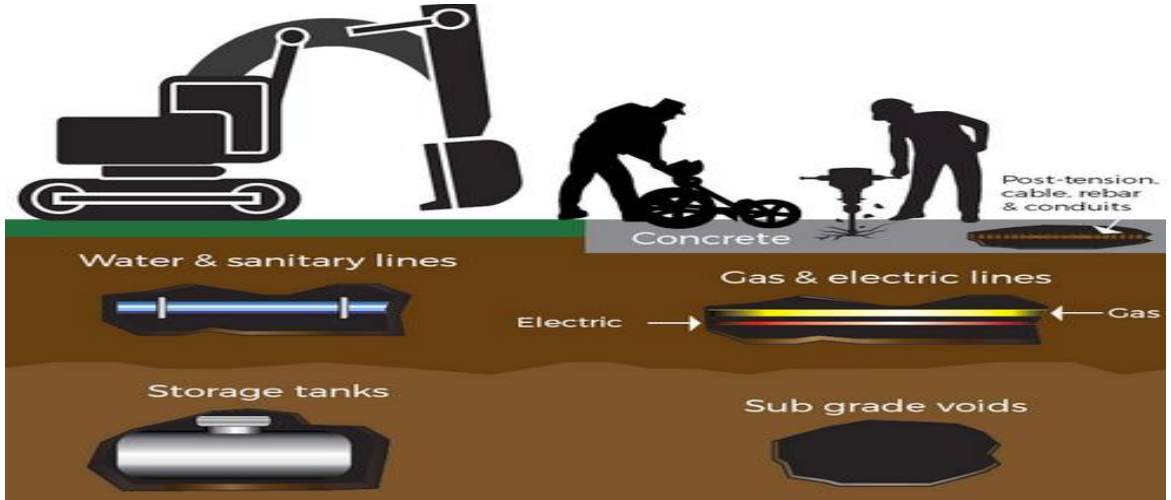
- Traditional systems are less reliable for locating deeper utilities, especially if inadequate frequency antennas are used.
- Lack of guidelines for equipment selection and test protocols for new methods

Objectives:

- Investigate technologies more accurately determined lateral position and depth of utilities to improve safety and optimize schedules for highway construction
- Develop requirements for the equipment and test protocols for data collection and data analysis.

❑ Duration: 12-months

❑ Drs. Salles de Salles and Khazanovich



Projects now being initiated

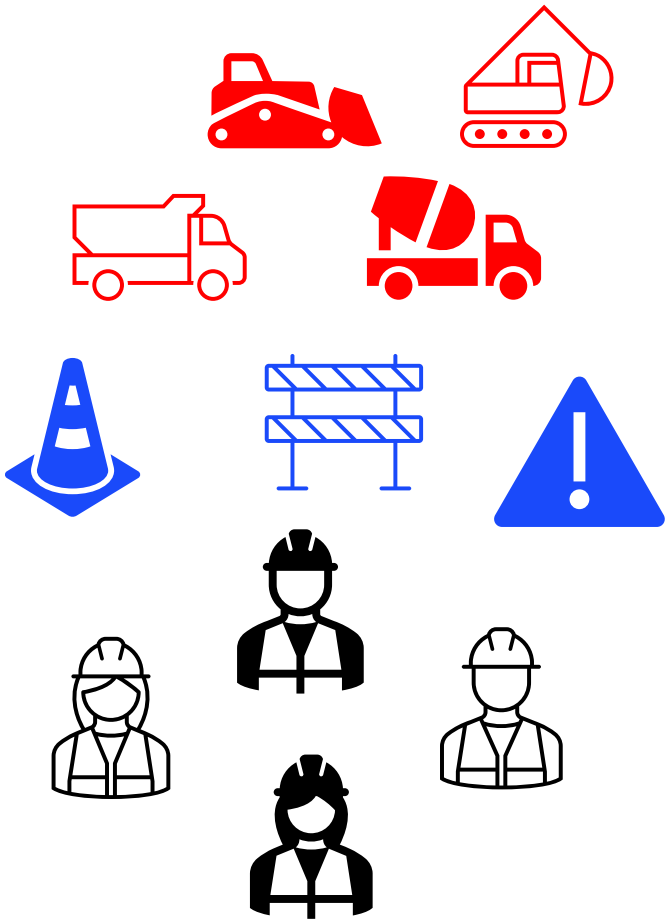
Problem:

- Greater than **100** workers killed and **20,000** injured in highway/street construction industry annually
- Almost half of the accidents from the movement of construction equipment and other construction-related activities.

Safety Database – Populate with accidents, health hazards near misses

Data sources:

- national and state agencies
- insurance companies
- contractors
- unions



- ❑ Duration: 12-months
- ❑ Drs. Salles de Salles and Khazanovich

Projects now being initiated

Problem: It is important o periodically assess the effectiveness of joint sealing and evaluate methods to optimize joint design, while limiting maintenance needs.

Objective: Evaluate the performance of joint sealants and the impact of sealant performance on pavement performance. Develop joint design strategies to optimize joint performance.

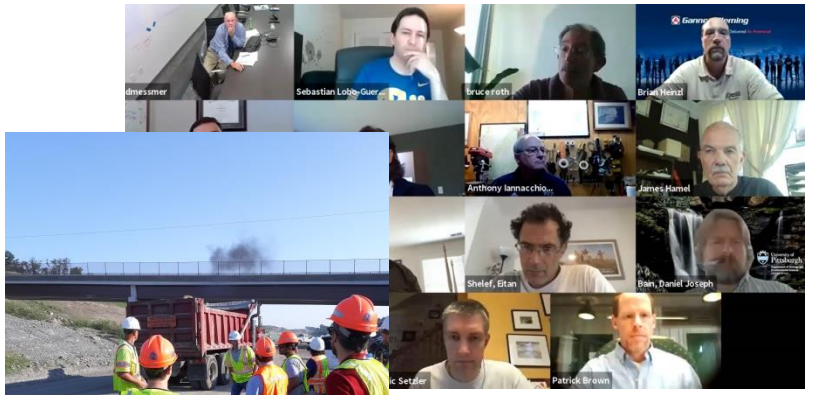
- ❑ Duration: 24-months
- ❑ Dr. Vandenbossche

Other activities

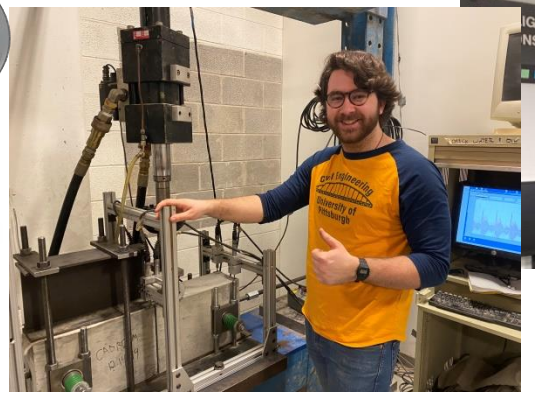
- Student involvement
- Workshops/seminars
- Demonstration projects
- Tech days
- Presentations on completed research

to help tech deployment

- etc.



Corrosion Prevention and Mitigation – Allegheny Cnty



https://www.engineering.pitt.edu/irise