



University of
Pittsburgh

Swanson School
of Engineering

PITT | **IRISE**

IRISE Consortium

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Impactful Resilient Infrastructure Science and Engineering (IRISE)

- Established in 2018 as a cooperative research consortium at the University of Pittsburgh
- **Public-Private-Academic** partnership uniting transportation agencies, industry and academia
- **Mission:** Develop implementable solutions for more durable, resilient infrastructure
- **Focuses** – addressing real-world needs (e.g., longevity, safety, sustainability)

A Unique Consortium Model

- **Member-driven research agenda** – projects target pressing challenges identified by members.
- All stakeholders involved from **problem definition** through **implementation**
- Public + Private + Academic collaboration ensures solutions have broad buy-in and applicability
- Emphasis on Implementation: research integrates into practice, not just reports



IRISE Partnership Structure

- **Consortium Members:**

- *Public:* PennDOT, PA Turnpike Commission, Allegheny County, Southwestern PA Commission
- *Private:* CDR Maguire, Golden Triangle Construction, Michael Baker International
- *Association:* Constructors Association of Western PA
- *FHWA is ex-officio*



PITT | IRISE - Denotes Founding Members



IRISE Research Portfolio

IRISE ACTIVITIES

- Impactful solutions
- Workshops
- Information repository
- Consensus gathering
- Information dissemination
- Field trials
- Technology deployment



IRISE Research Direction - 2025

Year 1

- **Material compatible repair**
- Corrosion
- Microbes
- Pitt Rigid

Year 2

- Bridge assessments
- Early opening
- Landslide workshop
- Landslide seminars

Year 3

- Benefit analysis
- JPCP Jt Design Opt.
- Landslide best practices
- AC pavement markings
- **Safer pave. construction**
- MCR Implementation

Year 4

- ABC Construction
- **Construction safety**
- Landslide inventory
- Utility location
- **Vibration compaction**

Year 5

- **Bridge deck corrosion**
- Dowel corrosion
- LWC Metamaterials
- **Seal coat best practices**
- Stormwater seminars
- Two-lift paving
- **VR safety**

Year 6

- **Bridge Load Ratings**
- Analysis of Recurring Landslides
- Large Language Pavement Model
- Self-Heating Concrete Pavement
- **3D LiDAR Point Clouds**
- Benefits Analysis

Year 7

- **Concrete LCA Tool**
- A.I. Safety Assistant
- Stormwater Seminars
- LiDAR Earthwork Collection
- Low CO₂ Concrete
- **Common Sense Compaction**



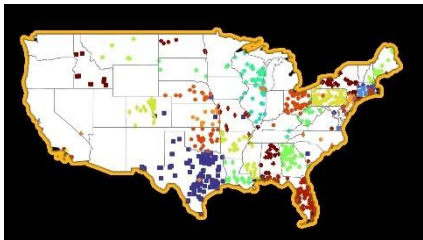
Research Focus Areas:

Bridges
Pavements
Materials
Geotechnical/Stormwater
Worker Safety
Other

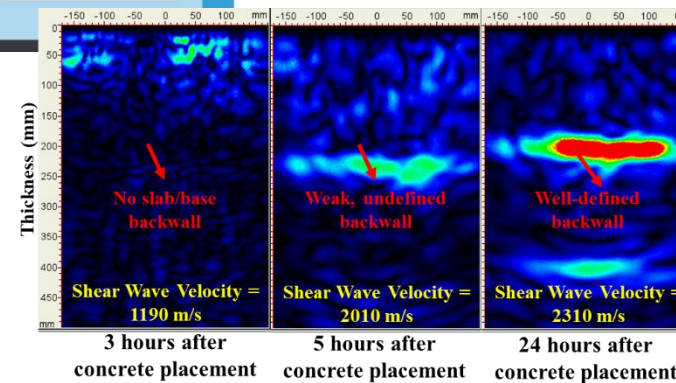
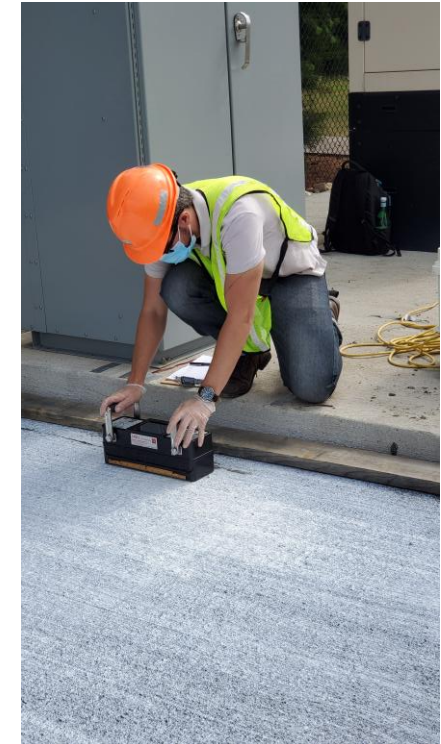
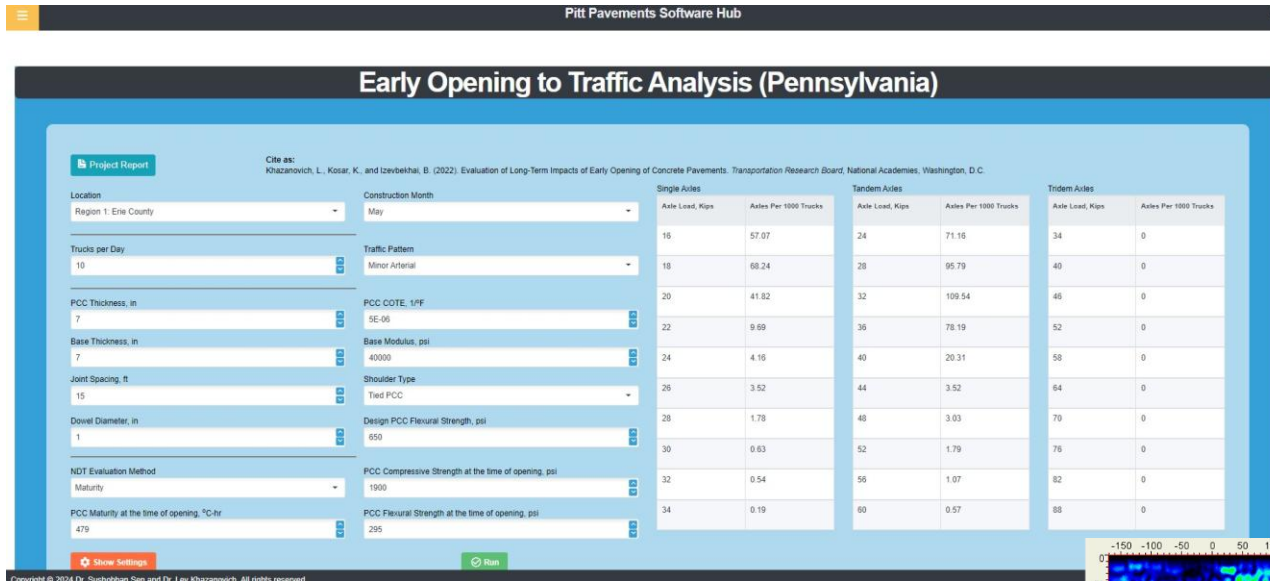
Completed Projects: 23
Ongoing Projects: 15

Completed Research Projects

- Identifying Major Causes of Construction Accidents for the Paving Industry in Pennsylvania, ***Dr. Khazanovich***
- Remote Controlled technology Assessment for Safer Pavement Construction and QA/QC, ***Dr. Khazanovich***
- Investigating New Underground Utility Location Technologies and Novel Methods to Improve Safety and Efficiency of Highway Construction, ***Dr. Khazanovich***
- A Novel Immersive Virtual Reality Platform for Health & Safety Training of Construction Workers, ***Dr. Fascetti***

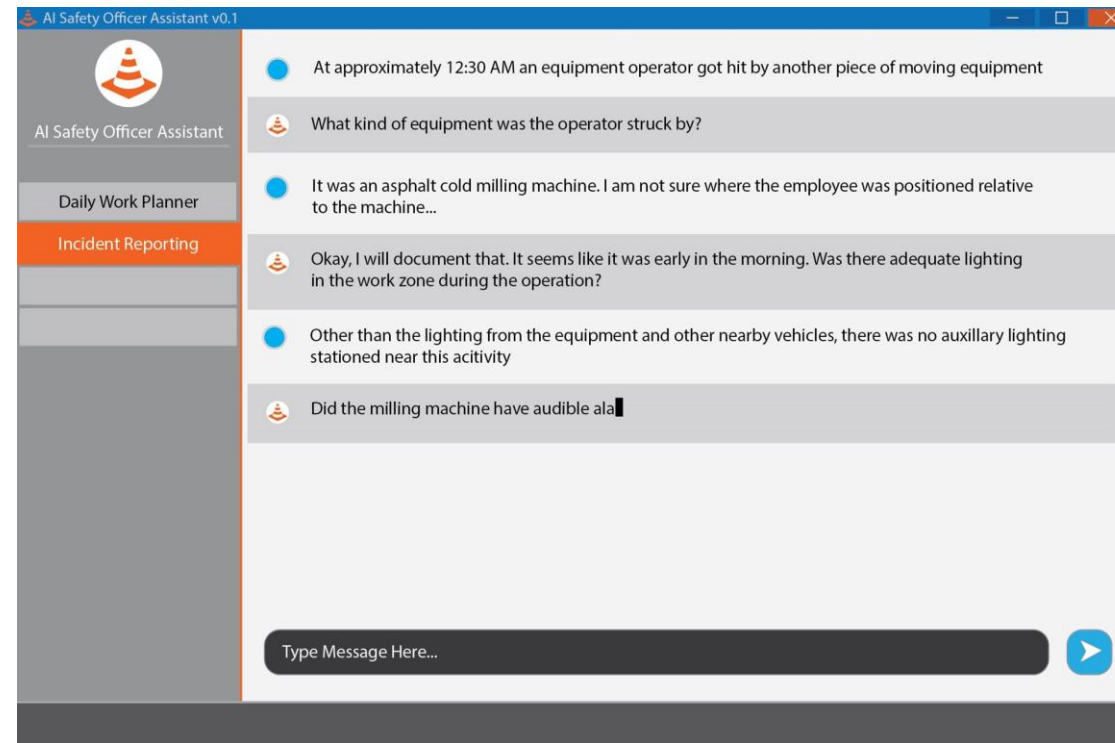


➤ Early Opening of Concrete Pavements to Traffic, *Dr. Khazanovich*



On-Going Research Projects

➤ AI Safety Assistant, *Dr. Khazanovich*



Upcoming Research Projects

- Virtual Reality Based Training for Work Zones Around Live Traffic, *Dr. Khazanovich*



- Reduced Life-Cycle and Construction Costs
- Improved Safety Outcomes
- Enhanced Infrastructure Resilience
- Significant Environmental and Sustainability Benefits
- Benefits Analysis is a bridge to PennDOT's implementation process



Example Benefit – Evaluation of Pavement Surface Distresses Related to Pavement Marking

- Using new methods to construct and repair longitudinal joints will result in savings by determining the cost of reapplying markings
- Improving longitudinal joint compaction
- Changing the placement of the marking



Example Benefit – Evaluation of Pavement Surface Distresses Related to Pavement Marking

- Two case studies of recent asphalt major longitudinal joint repair projects from ECMS (Allegheny and Beaver County Interstates) has determined that 1,180,950 lineal feet of longitudinal joints were repaired at \$1.60/LF
- The potential savings for reapplication of longitudinal pavement markings per year could be **\$1,937,772** for thermoplastic for the two case studies evaluated (lineal feet of markings adjusted from lineal feet of joint repairs)



Example Benefit – Remote-Controlled Technology Assessment for Safer Pavement Construction

- A broad technology scan was conducted to identify promising remote-controlled technologies for pavement testing
- Three technologies were identified to improve worker safety in work zones:
 - Automated Real-Time Thermal Profiling for Asphalt Paving based on the Pave IR system
 - Remote-Controlled GPR (Ground Penetrating Radar)
 - Autonomous Impact Protection Vehicle (AIPV)



Example Benefit – Remote-Controlled Technology Assessment for Safer Pavement Construction

- Project Benefits Conclusions
- Monetary of Technology Preventable Highway Worker Injury Reports of Vehicles intruding into active work zones in Pennsylvania 2017-2020
- Social and personal impacts of these injuries also need to be determined in future research efforts

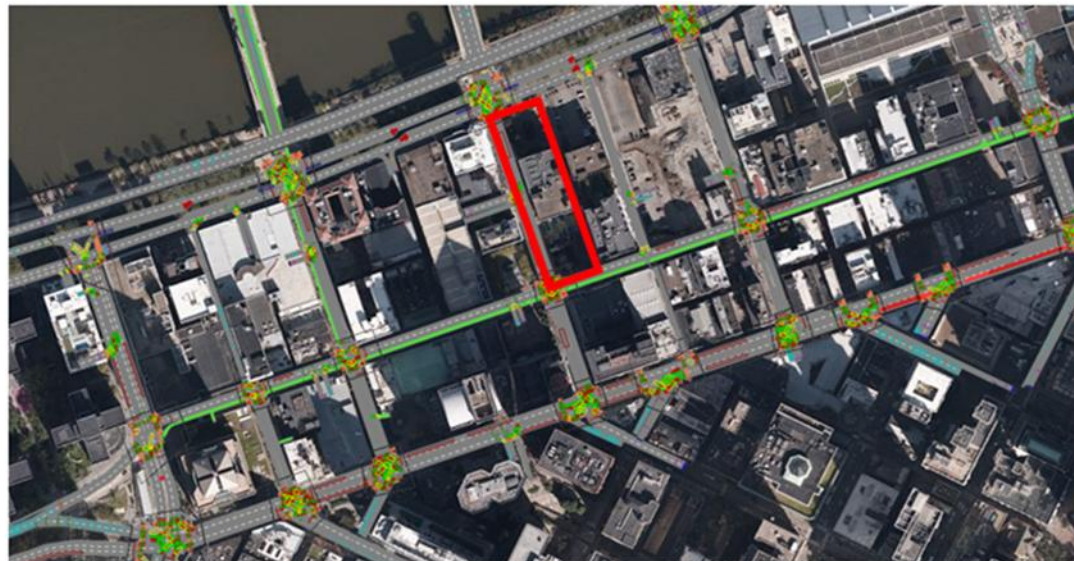
Year	Number of Injuries	Average Cost	Total	Inflation Factor	Present Value
2017	11	\$20,227	\$222,297	1.6	\$355,995.20
2018	4	\$20,227	\$80,908	1.7	\$137,543.60
2019	6	\$20,227	\$121,362	1.75	\$212,383.50
2020	2	\$20,227	\$40,454	1.82	\$73,626.28
Total					\$779,548.58

Example Benefit –Early Opening Concrete Pavements to Traffic

- Earlier opening of concrete pavement to traffic without an impact to short- and long-term pavement performance can reduce construction time and improve driver satisfaction by opening roadways in a shorter period
- To evaluate the estimation of concrete strength, laboratory and field studies were conducted using maturity and ultrasonic tomography
- A web-based tool was created to facilitate the implementation of this procedure for determining the optimal time when paving projects can be opened to traffic without significant damage “

Example Benefit –Early Opening Concrete Pavements to Traffic

- A hypothetical case study was analyzed
- A VISSIM traffic simulation model was used to determine the benefits to roadway users to early opening of roadways in urban areas
- The study focused on the benefits of one day (24 hours) of early opening of the street and the associated user benefits for additional delays



Example Benefit –Early Opening Concrete Pavements to Traffic

- Traffic Simulation Model of Urban Network closure of 7th Between Penn Avenue and Ft. Duquesne Boulevard
- The result of the analysis was the estimate of hours of user delay eliminated for every 24 hours of early opening of the roadway segment, which was then translated to user costs
- Users were broken down by passenger vehicles, buses and trucks
- This user benefit analysis showed that street closures due to work-zones in Pittsburgh Downtown can save user delay costs of \$123,645 for every 24 hours that the roadway is opened earlier

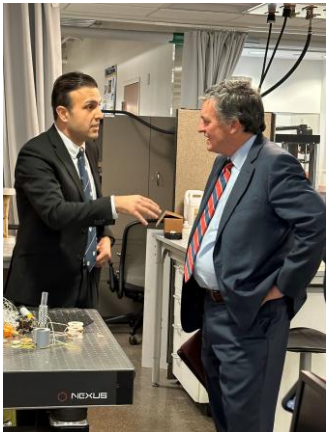
Focus on Implementation

Project Titles	Status
A Guide to Demonstration Projects in PA (Pitt CSTI)	10%
Early Opening of Concrete Pavements to Traffic (Pitt IRISE)	ECMS Proposal Evaluation
Material Compatible Repairs (MCRs) for Concrete Pavements and Bridge Decks (Pitt IRISE)	ECMS Proposal Evaluation
Reducing the Cost and Facilitating Broader Adoption of Ultra-High-Performance Concrete (UHPC) in Pennsylvania Bridges (Penn State CIAMTIS UTC)	ECMS Proposal Evaluation
Research Tech Transfer Assistance	ECMS Proposal Evaluation

Source: PennDOT Research Update – Brian Wall

Other IRISE Activities

- Student Engagement
- IRISE/ASHE/WTS Transportation Forum
- IRISE Brainstorming
- IRISE Annual Meeting
- PennDOT ELDP



Thank you!

Additional details can be found at...



<https://www.engineering.pitt.edu/Irise/>
Or Google “Pitt IRISE”



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