



# 2022 International Crosstie & Fastening System Symposium

24-25 May 2022 | Program



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## 2022 Symposium Sponsors



# 2022 Symposium Welcome

Dear 2022 Symposium Attendee,

Welcome to Champaign-Urbana, Illinois and the Department of Civil and Environmental Engineering (CEE) at the University of Illinois at Urbana-Champaign (Illinois). CEE at Illinois is home to the Rail Transportation and Engineering Center (RailTEC), and we look forward to you meeting the students, staff, and faculty that work within RailTEC and CEE.

We are pleased that you have chosen to attend the 2022 International Crosstie and Fastening System Symposium and hope you will actively participate in discussions and engage your fellow attendees throughout the event. Our objective is to facilitate the transfer of technology and knowledge as well as to further domestic and international communication and collaboration on the design and performance challenges and solutions for crossties and fastening systems. We are hopeful that you will enjoy the technical presentations, research discussions, Rail Transit and Class I keynote addresses, and your time in and around Champaign-Urbana.

We would like to thank the Federal Railroad Administration (FRA), Federal Transit Administration (FTA), BNSF Railway, voestalpine Nortrak, and Vossloh for their ongoing sponsorship of rail infrastructure research in RailTEC at Illinois. Without these organizations and the many other individuals and organizations that frequently provide input and guidance for our research we would not be able to conduct research and host an event such as this.

It is wonderful to be back meeting in person, and we are hopeful we can make up for lost time through fruitful interactions over the next few days. If there is anything that our team can do to make your stay in Champaign more enjoyable, please do not hesitate to contact one of the faculty, staff, or students within RailTEC. Have a wonderful week!

Sincerely,

Marcus S. Dersch

J. Riley Edwards

Arthur de Oliveira Lima

## RailTEC Infrastructure Research Sponsors



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# 2022 Symposium Overview

## Tuesday 24 May

Registration (Yeh Center Atrium, 1st Floor)	7:00am - 5:30pm
Light Breakfast	7:00am - 8:00am
Opening Remarks	8:00am - 8:20am
Technical Session 1	8:20am - 10:00am
Break	10:00am - 10:20am
Technical Session 2	10:20am - 12:00pm
Lunch (ECE Building, Room 3002)	12:00am - 1:30pm

**Rail Transit Keynote Address: Robert Powers - Bay Area Rapid Transit (BART)**

### **BART: Keeping The Bay Area Moving**

Technical Session 3	1:30pm - 3:10pm
Break	3:10pm - 3:50pm
Technical Session 4	3:50pm - 5:30pm
Dinner (Memorial Stadium)	6:00pm - 8:00pm

## Wednesday 25 May

Registration (Yeh Center Atrium, 1st Floor)	7:00am - 12:30pm
Light Breakfast	7:00am - 8:00am
Technical Session 5	8:00am - 9:30am
Break	9:30am - 9:50am
Technical Session 6	9:50am - 12:00pm
Lunch (ECE Building, Room 3002)	12:00pm - 1:30pm

**Class I Railroad Keynote Address: John Cech - BNSF Railway**

### **Engineering a Resilient Supply Chain**

Technical Session 7	1:30pm - 3:30pm
Break	3:30pm - 3:50pm
Technical Session 8	3:50pm - 5:00pm

# Symposium Locations

## **Newmark Civil Engineering Laboratory**

Yeh Center - All Technical Sessions will be held in 1310 Yeh Center.

## **Electrical and Computer Engineering (ECE) Building**

306 N. Wright St., Urbana, IL 61801

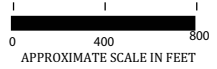
## **Memorial Stadium**

1401 S. 1st St., Champaign, IL 61820

## **Engineering Hall Patio**

1308 W. Green St., Urbana, IL 61801 (North side of building)

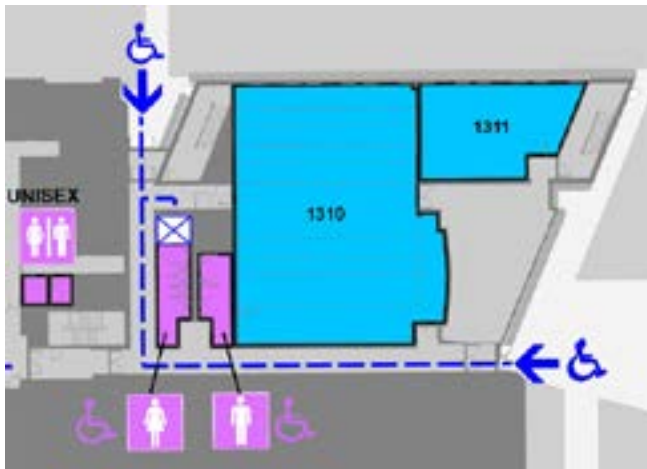
## Campus Map



- A** Newmark Lab & Yeh Center
- B** ECE Building
- C** Engineering Hall



### Yeh Student Center (Newmark Civil Engineering Lab)



## Tuesday Spoken Presentations

### 8:20 Session 1 - Concrete Crosstie Prestressing Research

#### **Properties of Larger-Diameter Prestressing Wires and Their Use in Pretensioned Concrete Railroad Ties**

*Bob Peterman - Kansas State University*

#### **Prototype Development of Concrete Crossties with Adaptive Prestressing System**

*Bassem Andrawes - University of Illinois Urbana-Champaign*

#### **Structural Behavior of Polymer Concrete Crossties Prestressed With Basalt FRP Bars Tested as Per AREMA Testing Standards**

*Mohsen Issa - University of Illinois at Chicago*

10:00 Break

### 10:20 Session 2 - Concrete Crosstie Performance and Materials

#### **Florida East Coast Railway and Brightline: Utilizing Historic Track Infrastructure to Offer Premier Freight and Passenger Rail Service for the Future**

*Tom Roadcap - Brightline*

*David Wenrich - Florida East Coast Railway*

#### **Theoretical Optimization of Track Stiffness Transitions with Interspersed Concrete Crossties**

*Ricardo Quiros - voestalpine Railway Systems Nortrak*

*Jaeik Lee - University of Illinois Urbana-Champaign*

#### **Development of High Performance Concrete Using Non-steel fiber for Prestressed Concrete Crossties**

*Moochul Shin - Western New England University*

#### **A Decade of Progress: A Review of Recent Concrete Crosstie Research in North America**

*Riley Edwards - University of Illinois Urbana-Champaign*

Noon Lunch - ECE Building - Room 3002

### **Rail Transit Keynote BART: Keeping The Bay Area Moving**

*Robert Powers - Bay Area Rapid Transit*

# Tuesday Spoken Presentations

## 1:30 Session 3 - Crosstie Elastic Fasteners

### **Effect of Track Component Stiffness and Strength on Longitudinal Rail Seat Loads**

*Marcus Dersch - University of Illinois Urbana-Champaign*

### **Evaluating Glass Fiber Reinforced Composite Sleepers to Mitigate Spike Fatigue Failure: A Finite Element Study**

*Shushu Liu - Volpe National Transportation Systems Center*

### **Investigation of Spike Breakage at FAST and Revenue Service**

*Yin Gao - MxV Rail*

### **Screw Spike Spring Washer Resiliency and Installation Investigation: Preliminary Findings and Path Forward**

*Christian Khachaturian & Marcus Dersch - University of Illinois Urbana-Champaign*

3:10 Break

## 3:50 Session 4 - Track Inspection 1

### **3D Laser Scanning and Artificial Intelligence for Change Detection and Track Health Index Reporting**

*Richard Fox-Ivey - Railmetrics*

*Paula Palma and J. Riley Edwards - University of Illinois Urbana-Champaign*

### **Locomotive Truck Mounted Track Measurement System**

*Sabri Cakdi - Holland LP*

### **Efficiencies in Track Maintenance: Tie Gang Automation**

*Jeb Belcher - Loram*

### **Fully Georeferenced Multi-Sensor 3-D Machine Vision Data Integration for Real-time Alerting of Crosstie and Fastening Asset Defects**

*Darel Mesher - Tetra Tech*

### **Precision Maintenance Planning: How VisioStack and BNSF Leverage Data to Automate Decisions**

*Zach Garner - VisioStack*

*Ben Klein - BNSF Railway*

5:30 Adjourn Technical Sessions

6:00 Dinner at Memorial Stadium

## Wednesday Spoken Presentations

### 8:00 Session 5 - Track Inspection 2

#### **FRA Update on Comprehensive Track Assessment and Track Degradation Research**

*Radim Bruzek - ENSCO, Inc.*

#### **In Situ Inspection of Railroad Crossties by Lateral Migration Radiography**

*Timothy Mueller - University of Florida*

#### **Automated Railroad Ballast Fouling Condition Inspection in Support of Crosstie – Deep Learning-based Algorithm and Automated Scanning Vehicle Development**

*Jiayi Luo - University of Illinois Urbana-Champaign*

#### **Field Verification of Elastic Modulus Measurements**

*Tim Stark - University of Illinois Urbana-Champaign*

9:30 Break

### 9:50 Session 6 - Composite Crosstie Design and Performance

#### **Thermal Effects on Material and Mechanical Properties of Composite Crossties**

*Jeremy Beasley - U.S. Army Engineer Research and Development Center*

#### **Laboratory Testing of Composite Ties or Composite Bearers for Turnouts**

*Stephan Freudenstein - Technical University of Munich*

#### **Establishing the Performance Frontier for EPC Ties in North American Freight Rail**

*Edmonn Maul - Evertrak LLC*

#### **Polymeric Sleepers - New Development Challenges**

*Aldo Machado - Braskem*

#### **Study of the Polymeric Crosstie Behavior Monoblock in AMV**

*Arthur Bilheri - University of Illinois Urbana-Champaign & MRS Logistica*

#### **New & Innovative Structural Materials for the Rail Industry**

*Claudio Subacchi - FSC Tech*

Noon Lunch - ECE Building - Room 3002

### **Class I Railroad Keynote Engineering a Resilient Supply Chain**

*John Cech - BNSF Railway*



# Wednesday Spoken Presentations

## 1:30 Session 7 - Crosstie Support Investigations

### **Under-Tie Support Condition Assessment based on Tie Deflection Profiles**

*Hai Huang - Penn State*

### **Tie Reaction Measurement under Dynamic Loading using Rail-Mounted Strain Gauges**

*Deb Mishra & MD Fazle Rabbi - Oklahoma State University*

### **Track Support and Resilient Materials at BNSF - Experience and Research**

*Erik Frohberg - BNSF Railway*

*Brett Myskowski - University of Illinois Urbana-Champaign*

### **Investigation into the relevance of UTP bedding modulus when measured using the Geometric Ballast Plate**

*Scott Tripple & Dillon Benros - Pandrol*

### **Proposed Coating Practices to Maximize Functional Life Spans for Concrete and Wood Components within RR Tracks and Bridges**

*William H. Moorhead - TRAMMCO, LLC*

*Jerry G. Rose - University of Kentucky*

3:30 Break

## 3:50 Session 8 - Timber Tie Updates

### **Title Pending**

*Jeff Lloyd - Nisus*

### **Lifecycle of a Wooden Tie**

*Brad Crawford - Stella-Jones Corporation*

*Ryan Richardson - Loram*

### **Using Asphalt as an Alternative for Under Tie Pads and Wood Tie Coating**

*Ramez Hajj - University of Illinois Urbana-Champaign*

5:00 Adjourn Technical Sessions

5:15 Dinner at Engineering Hall Patio

## Rail Transit Keynote



### Robert Powers

General Manager

Bay Area Rapid Transit (BART)

The BART Board of Directors unanimously appointed Robert (“Bob”) M. Powers as BART’s tenth General Manager on July 25, 2019. As General Manager, Powers manages an operating budget of \$1 billion, oversees \$1.4 billion in capital projects, and leads an agency with 4,000 employees that keeps the San Francisco Bay Area moving. Powers helps to carry out BART’s mission to provide safe, reliable, clean, quality transit service while putting the riders first and prioritizing the safety of all.

Powers, a licensed Professional Engineer, has more than 20 years of experience in the public transportation industry overseeing major infrastructure projects and transportation programs. He holds a Bachelor of Science degree in Civil Engineering and a Master of Science degree in Structural Engineering, both from the University of Illinois at Urbana-Champaign.

Powers began his career at BART in 2012 as the Assistant General Manager of Planning, Development and Construction where he was responsible for multi-million-dollar capital projects, including the expansion of BART service into Antioch and South Fremont, and all planning efforts to modernize stations and develop land near stations to help solve the Bay Area’s housing crisis and bring jobs closer to where people live.

Prior to joining BART, Powers served as the Deputy Director, and Director of Major Projects for the Seattle Department of Transportation (SDOT). He also served as the Division Chief of Transportation Engineering and Construction Division, as well as the Conduits Division, for the Baltimore City Department of Transportation (BCDOT).

Powers is currently on the Board of the American Public Transportation Association (APTA), Executive Board of the Bay Area Council, and serves as Chair of the Clipper Executive Board (CEB).

## Class I Railroad Keynote



### John Cech

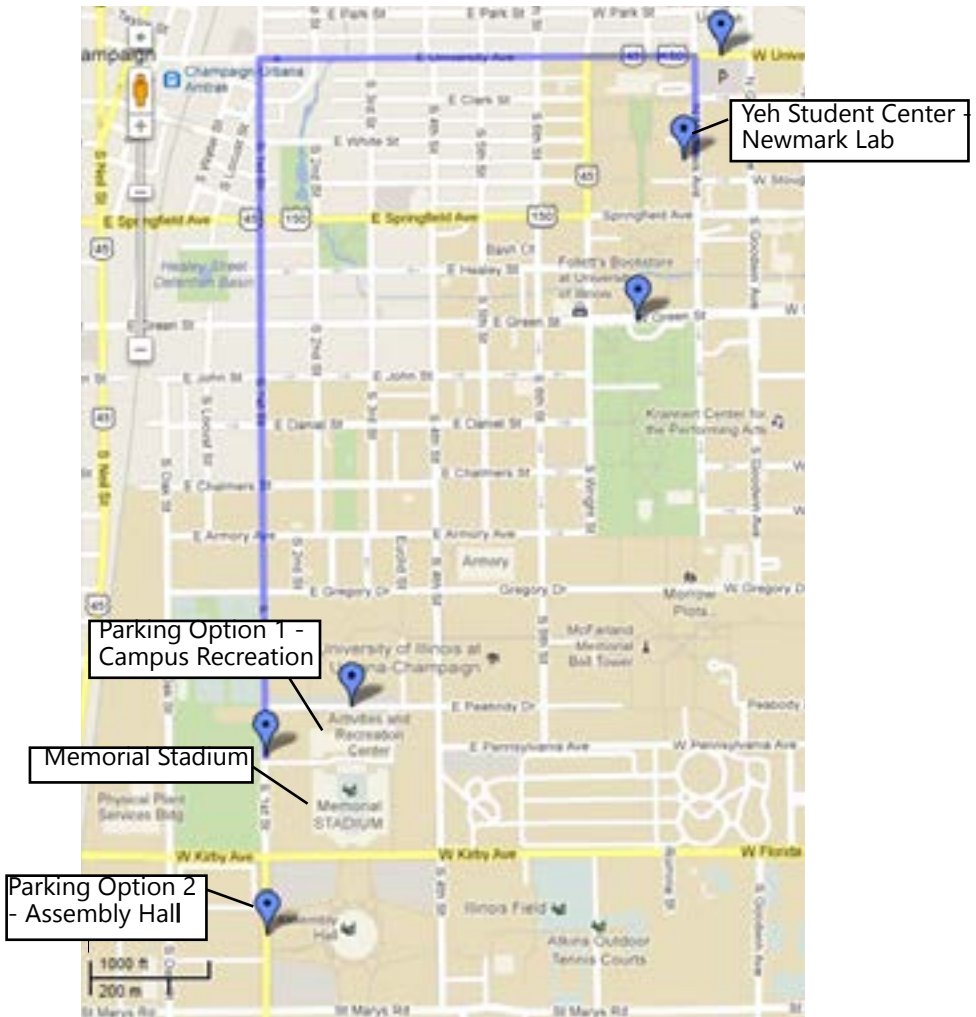
Vice President, Engineering

BNSF Railway

John Cech was named vice president, Engineering in August 2018. Cech is responsible for the inspection, construction, maintenance and repairs of BNSF’s track, bridges, tunnels and other structures along BNSF’s right-of-way.

Cech has held various positions within Engineering since joining BNSF as a management trainee in 1994. He was promoted to roadmaster in Gallup, N.M., in 1996 and served in several roles with increasing responsibility including division engineer in Houston starting in 2000 and in Alliance, Neb., beginning in 2003. Cech was promoted to director, Roadway Planning, in 2006 and assumed the role of general director, Line Maintenance, in 2008. He served as assistant vice president, Engineering Services, from 2012 until 2014 and then served as assistant vice president and chief engineer, Central Region. Cech most recently served the Engineering Department as assistant vice president and chief engineer for System Maintenance and Planning.

# Memorial Stadium Dinner Map



**Yeh Student Center** - Newmark Civil Engineering Laboratory, 205 N. Mathews Ave, Urbana, IL 61801

**Memorial Stadium** - (Dinner in the 77 Club on 6th Floor - **Enter Stadium at Gate 16 on the West side**) - 1402 South 1st Street, Champaign, IL 61820

**Transportation will be provided from the Yeh Student Center. If you wish to drive there are 2 parking options:**

**Parking Option 1** - Campus Recreation (metered spots, requires payment)  
201 East Peabody Drive, Champaign, IL 61820

**Parking Option 2** - Assembly Hall  
1800 South 1st Street Champaign, IL 61820



## Wireless Internet Connection:

Choose the "IllinoisNet\_Guest" wireless network.

Open an internet browser and the UI Wireless page should load.

Select the "Register a temporary guest account" link below the Log In.

Fill out the form, accept the terms of use, and click Register.

The University is legally required to collect your information before providing you with network access.

Click the Log In button at the bottom of your confirmation page

For help with the Illinois wireless network, please contact the Help Desk at 217-244-7000.

Note: WiFi Registration forms are valid for a 24 hour period. A new registration form will need to be completed to gain access after 24 hours.

### Conference Contacts:

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<http://railtec.illinois.edu/>