State of the Program Address
RailTEC Infrastructure Research Program

FRA and FTA Industry Partners Meeting
4 November 2015 – Tucson, AZ
Riley Edwards, Marcus Dersch, Yu Qian, and Matthew Csenge

Outline

• Introduction
• Vision and Objectives
• Pyramid
• Current Projects, Sponsors, and Team
• Research History Timeline
• Students, Presentations, and Publications
• Accomplishments
• Growth Areas
• Path Forward
• Questions and Comments

Allerton Park and Mansion:
Location of Summer 2015 Team Retreat and 2016 Symposium Keynote Address and Dinner
Infrastructure Research Team

• Previous Personnel
  – 16 Graduate Research Assistants (Zeman, Gutierrez, Kernes, Shin, Grasse, Rapp, Shurpali, Van Dyk, Bizarria, Manda, Van Dam, Williams, Zhang, Chen, Greve, Csenge)
  – At least 20 Undergraduate Research Assistants
  – 1 Post Doctoral Researcher
  – 1 Manager of Field Instrumentation
  – 1 Research Engineer (Kernes)

• Current Personnel
  – 12 Graduate Research Assistants
  – 8 Undergraduate Research Assistants
  – 1 Manager of Experimentation
  – 1 Senior Research Engineer
  – 1 Research Engineer
  – 4 Principal Investigators (PIs)
Infrastructure Program Objectives

- Solve real-world design and performance challenges associated with railway infrastructure and its components
- Strive for a healthy balance of materials, component, and system-level research and testing projects
- Meet railroad industry and University objectives
- Intentionally mentor students and foster interest in the subject, training future leaders in the fundamentals of rail engineering
Program Elements and Integration

Materials Research
- Concrete Mixture Design

Component Research
- Crosstie Flexural Design

System Level Research
- FEM
- RAIL TLS

Linked together using field and laboratory experimentation and FE modeling

Program Flow and Implementation of Results

Obtain Reliable Data from FE Model, Field and Laboratory Experimentation

Turn Data into Information that is Academic, and Relevant to AREMA Chapter 30 (Ties)

Publish Journal Articles and Coordinate with AREMA to Implement Changes to AREMA Chapter 30 (Ties)
Current Infrastructure Research Sponsors

- Federal Railroad Administration (FRA), Federal Transit Administration (FTA), and NURail Center (Crosstie and Fastening System Design, Performance, Wear, Fatigue, Cracking, Environmental, etc.)
- Amsted RPS (Fastening System Wear and Fatigue)
- GIC (Improved Concrete Crosstie Design)
- RAIL.ONE (Improved Concrete Crosstie Design)
- Union Pacific Railroad (Field Performance of Concrete Crossties)
- Vossloh (Fastening System Load Transfer)
- New York City Transit (NYCT) (Bolted Joint Modeling and Experimentation)
Research Program Timeline

2008 August – Hired First Graduate Research Assistant (John Zeman)
2008 October – Attendance at First AREMA C-30 Meeting in Savannah, GA
2009 January – First Research Project (CN and AAR funding)
2009 August – Hired Second Graduate Research Assistant (Mauricio Gutierrez)
2009 October – Second Research Project (Amsted RPS funding)
2010 August – Hired Third Graduate Student (Ryan Kernes)
2011 January – Hired Full-Time Research Engineer (Marcus Dersch)
2011 January – Third Research Project (NEXTRANS Co-Funding)
2011 June – FRA Tie and Fastener BAA awarded (Hired Graduate Research Assistants (Sihang Wei, George Chen, Justin Grasse, and Brandon Van Dyk)
2011 Summer – Hired Graduate Research Assistants for Amsted RPS and NEXTRANS Projects (Chris Rapp and Amogh Shurpali)
2012 January – Hired Postdoctoral Researcher (Moochul Shin)
2012 Summer – Hired Second Research Engineer (Ryan Kernes) and Graduate Research Assistants (Thiago Bizarria, Emily Van Dam, and Brent Williams), Two Additional FRA BAA Projects Awarded
Research Program Timeline (Cont.)

2013 Spring – FRA BAA Modification #2 Awarded

2013 Summer – Hired Graduate Research Assistants for Amsted RPS and FRA Tie and Fastener BAA Projects (Matthew Greve and Kartik Manda) and FRA BAA Modification #3 Awarded

2013 Fall – Hired Graduate Research Assistants Matthew Csenge and Andrew Scheppe, GIC Project Awarded

2014 Spring – Hired Graduate Research Assistant Henry Wolf, Marcus Dersch Promoted to Senior Research Engineer, IntegriCo Project and FRA RSD Projects Awarded

2014 Summer – Hired Graduate Research Assistants Bosco Munyaneza and Donovan Holder

2014 Fall – Hired Graduate Research Assistants Kaijun Zhu and Josue Bastos, Hired Research Engineer Yu Qian, NYCT, UPPR, and Vossloh Projects Awarded

2015 Spring – New FRA BAA 2014-2 Project Awarded

2015 Summer – Hired Graduate Research Assistants Zhengboyang Gao and Aaron Cook, New RAIL.ONE, NDT Corp., and Federal Transit Administration (FTA) Projects Awarded

2015 Fall – Hired Graduate Research Assistant Alejandro Alvarez Reyes

Infrastructure Program Students/Staff

Students → The ultimate final deliverable
Progression of students into industry → Very impactful to our program
Papers, Posters, and Presentations

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FRA Final Report – Update

- Finalized and posted on internal portion of RailTEC website
- USE IT!
- SHARE IT with Industry Partners! (or others with permission)
- FRA is working to publish it and technical editors are reviewing it presently (thanks Cam)

Website: http://railtec.illinois.edu/CEE/Crossties/FRA_Final_Report.php
Final Report - Table of Contents

**Executive Summary**

**Volume 1**

1. Introduction and Background
2. Mechanistic Design of Concrete Crossties and Fastening Systems
3. Results and Conclusions
4. References
5. Abbreviations and Acronyms

**Volume 2**

1. International Survey Results
2. Loading Quantification Document
3. Laboratory Instrumentation Plan
4. Laboratory Instrumentation Results
5. Field Instrumentation Plan
6. Field Instrumentation Results
7. Modeling Methodology and Development
8. Modeling Results (Parametric Analyses) and Conclusions
9. Analytical Model (I-TRACK) Development and Capabilities
10. References
11. Abbreviations and Acronyms

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2014-2015 Accomplishments – Personnel

- Improved teamwork (noted both internally and externally)
- Continued strength in building relationships with industry
  - Good examples in CO at JRC and AAR conferences
- New hires:
  - Two New MS Students (Gao, Aaron, and Alejandro)
  - Many new hourly assistants
  - Research Engineer Yu Qian
  - Experimentation Manager Matthew Csende
RailTEC’s RAIL Grand Opening

19 August 2015

Joseph Leader (NYCT Senior VP) with Matthew Csenge, Yu Qian, and Melanie Loots (Asst. Vice Chancellor for Research at UIUC)
19 August 2015
Joseph Leader (NYCT Senior VP) with Jose Mediavilla (RPS Director of Engineering – Fastenings)

2014-2015 Accomplishments - Projects

• First RailTEC Transit Research Project (NYCT)
• First major RailTEC Class I rail infrastructure research project (UPRR)
• International sponsors (Vossloh and RAIL.ONE)
• Additional field experimental programs: Vossloh, Class I Freight Railroad, and FTA Projects
• Large BAA under the “new FRA budget”
• Long awaited award of FTA Project!
• Continue to position ourselves for future projects

These projects are important because they relate to our ability to educate and employ (place) students.
2016 International Crosstie & Fastening System Symposium

- Co-organized by: RailTEC, AREMA Committee 30 (Ties), Railway Tie Association (RTA)
- Three day conference with presentations, discussions, and a technical tour
- Focus → state of the art in crosstie and fastening system design, performance, research, modeling, and inspection
- 14-16 June 2014 – Sessions on UIUC campus in Champaign, IL
  15 June 2014 – Technical tour to UIUC’s Research and Innovation Laboratory (RAIL)
- Strong domestic and international participation; addressing topics including:
  - Laboratory and Field Testing
  - Component and System Modeling
  - Automated Inspection Technologies
  - Many more…

Acknowledgements – Research Sponsors

- U.S. Department of Transportation
  Federal Railroad Administration
  Rail Product Solutions
  NURail Center
  Building America
  MTA
  New York City Transit
  GIC
  RAIL.ONE
  Vossloh
Acknowledgements – Industry Partners

FRA Tie and Fastener BAA:

FTA Tie and Fastener Research Project:

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