CFIRE NEWS

Fall 2012 Quarterly Newsletter Volume 6, Number 2-3

In this issue

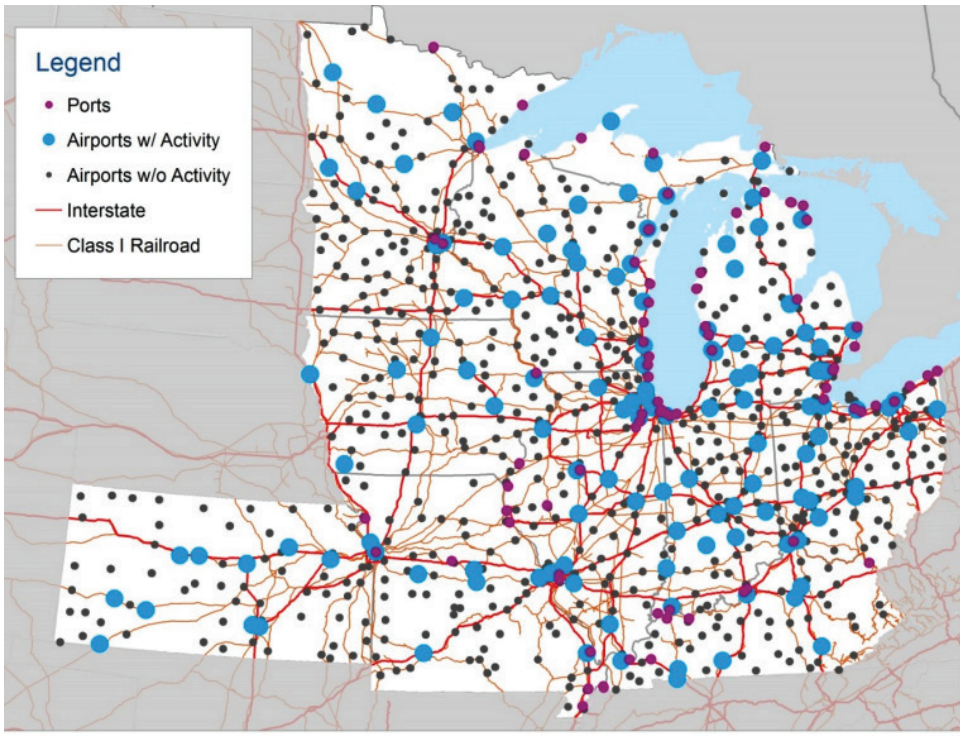
Air Cargo in the MAFC Region

The Mid-America Freight Coalition (MAFC) region plays an integral role in the freight infrastructure of the United States and the world. In 2010, total freight movement originating or terminating in the MAFC region was valued at almost $5 trillion; air cargo shipments account for $155 billion of this total. This represents almost 31 percent of all U.S. freight movements and 16 percent of air cargo movements. Freight movement in the region is expected to grow on par with the rest of the United States through 2040. In this same period, air cargo in the MAFC region is projected to grow by 4.9 percent compared to 3.2 percent for all modes.

Much of the study of freight movement in this region focuses on highway, rail, and maritime freight. Air cargo is a less-studied yet critical component of freight infrastructure in the MAFC region.

Researchers from CFIRE and the Texas Transportation Institute recently completed a project that provides an overview of air cargo transportation in the MAFC region, including the industry's recent history, security implications, an integration within the greater regional economy. The project team created an inventory of air cargo facilities in this region, including airports, air cargo screening facilities, and foreign trade zones.

Researchers also analyzed air cargo activity by weight, value, and commodity for the entire region, for each of the ten states, and for individual airports.



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From the Director's Chair

The Fall semester is wrapping up here at the University of Wisconsin–Madison, and it's been filled with lots of accomplishments, both on new and on-going initiatives.

In September, CFIRE and the Wisconsin DOT hosted the 2012 Mid-Continent Transportation Research Forum. The Forum hosted a town hall discussion on the future of transportation research, which featured WisDOT Secretary Mark Gottlieb, Iowa DOT Director Paul Trombino, and RITA Adminstrator Greg Winfree. Check out the conference archive [link] for presentations on a wide range of transportation research topics.

In the coming months, CFIRE is sponsoring several other important events. In February, CFIRE will conduct a Freight Workforce Summit and a Student Freight Symposium, both hosted by the Intermodal Freight Transportation Institute at the University of Memphis. The Student Freight Symposium will help build a cohort of students who will lead freight transportation in the future. The Freight Workforce Summit builds upon the results of the National Transportation Workforce Summit by working with major employers in the freight industry.

CFIRE is continuing to tackle complex freight issues on a regional level. In March, the Mid-America Freight Coalition (MAFC) is combining forces with the Institute for Trade and Transportation Studies (ITTS) and the Kentucky Transportation Cabinet to hold a Joint Annual Freight Meeting in Louisville, Kentucky. This combined meeting will focus on the theme of Building Paths to Prosperity: The Role of Regional Corridors, providing unique opportunities to facilitate discussions among freight professionals from more than twenty states and to develop freight capacity at the interstate level. The agenda is already shaping up well and this meeting promises to be one of our best yet.

In conjunction with the Joint Annual Freight Meeting, CFIRE will be bringing together a broad range of stake holders for an important discussion on the beneficial use of dredged materials. This Summit will bring together state DOT engineers, researchers, government representatives, and other industry experts to explore the use of dredged materials in transportation projects.

Over the last several months, CFIRE researchers have completed a number of projects on a wide array of freight-related topics. I hope you'll check our website for new reports on air cargo, freight stakeholder behavior, the economic benefits of freight infrastructure investment, measuring the value of delay for shippers, and estimating areawide truck freight values, as well as the impact of overweight vehicles on bridge decks, new ways to build bridge abutments, and better performing bridge approach slabs.

We'd like to congratulate Dan Moser, who has been named the 2012 CFIRE Student of the Year in Transportation. He'll be presented with this award at the Council of University Transportation Centers Annual Awards Banquet on January 13, 2013 in Washington, DC.

And finally, we invite you to join us at the Wisconsin Transportation Reception at the 2013 Transportation Research Board Annual Meeting [link]. As with previous years, the Packers will be in the playoffs and on the big screen at the reception. We hope to see you in Washington, DC in January.

We at CFIRE wish you a happy holiday season and a safe and prosperous new year.

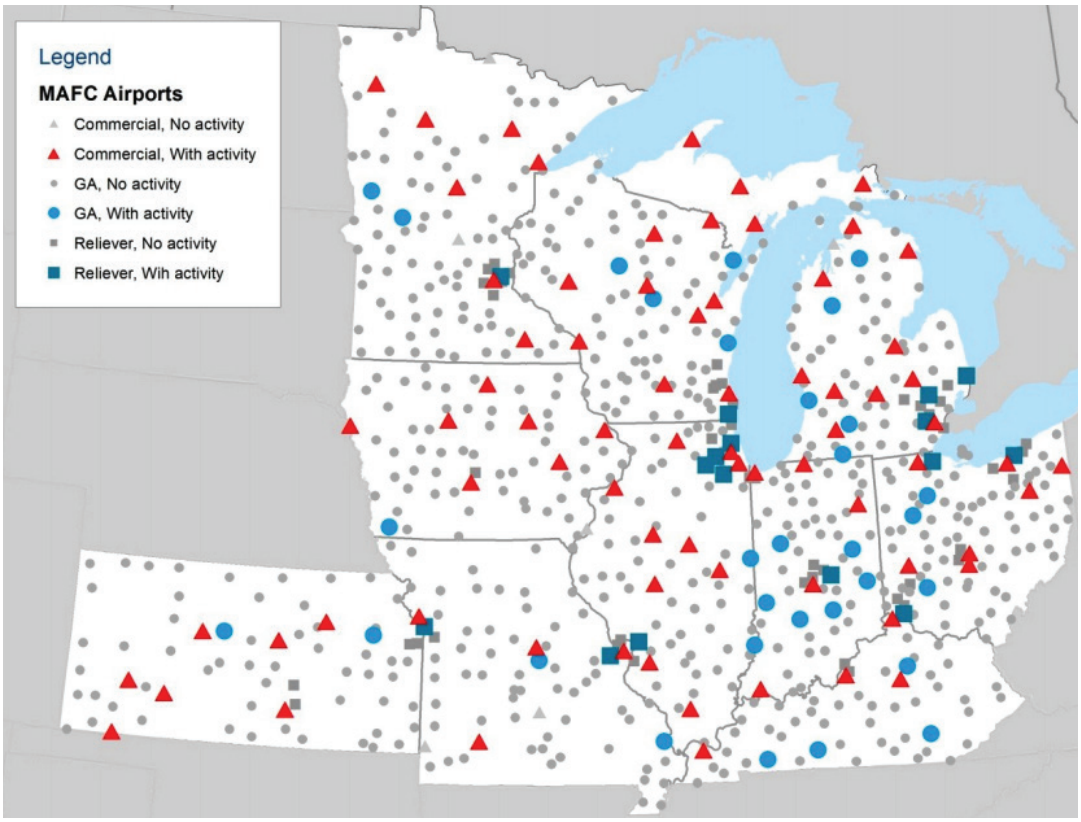
Continued from page 1...

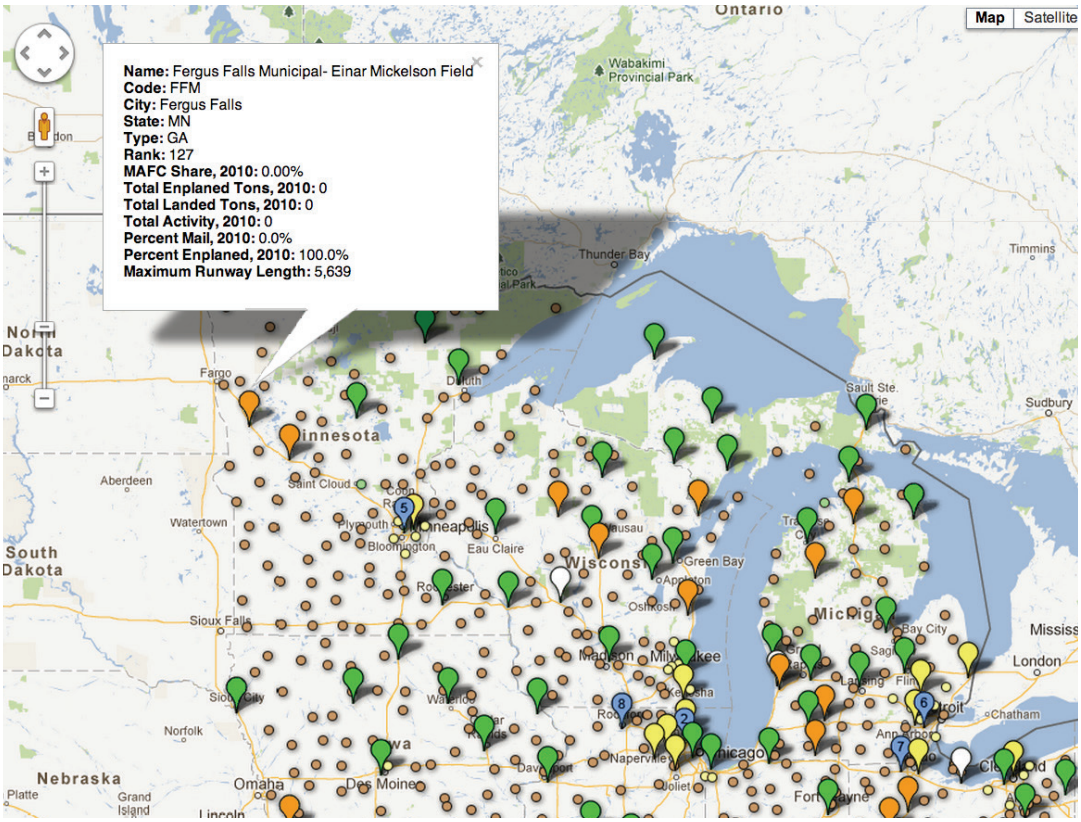
As a result of these analyses, researchers were able to make a number of recommendations for airport planners and decision-makers. First, they should use the results of this study to understand the air cargo industry in the region and how it is near maturity. Second, planners and decision-makers should use the same publicly available data sets used in the study in their decision-making process. And finally, the research team recommends that smaller airports include the airport fixed-base operator (FBO) in this process.

As part of this project, researchers have also created an interactive map (sample below, right) that shows tonnage statistics for airports in the MAFC region.

For more information, check out the interactive map (cfire.wistrans.org/research/projects/04-11/air-cargo-in-the-mafc/).

For more information about this project and to read the final report visit cfire.wistrans.org/research/projects/04-11.



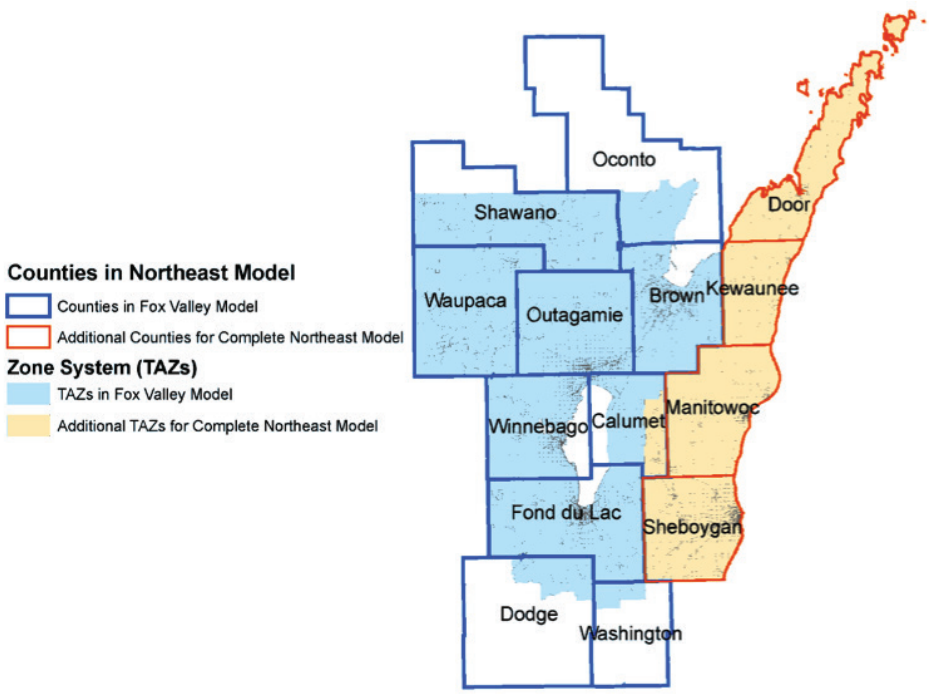


Understanding and Modeling Freight Stakeholder Behavior

Freight transportation planning for efficiency, economic competitiveness, environmental sustainability, and other community goals requires a way to accurately forecast the way that freight patterns will respond to infrastructure improvements, demand management strategies, and traffic control measures.

CFIRE affiliate researchers recently completed a project that developed a conceptual model of private-sector freight stakeholder decisions and interactions for forecasting freight demands in response to key policy variables. This project, entitled Understanding and Modeling Freight Stakeholder Behavior, was led by Dr. Jessica Guo, formerly of the University of Wisconsin-Madison and a CFIRE Associate Director.

The conceptual framework defines choices and decisions most relevant to freight planning concerns and demand forecasting needs at the regional and urban levels. The framework includes decisions ranging from production/ consumption decisions to supply chain and inventory replenishment, shipment origin, destination, content, timing, quantity, mode, and routing decisions.



Researchers then conducted a series of face-to-face interviews to guide the further development of the model, and to confirm the idea that collaboration amongst firms could have a direct impact on freight movement and how freight movement data is collected. The interviews also revealed the highly variable ways that similar businesses make their freight-related decisions.

The framework attempts to capture intra-firm collaboration by capturing various vertical integration structures, by considering internal sourcing within a firm, by determining how unsatisfied demand in a multi-establishment firm is served by external suppliers, and by considering how joint ordering across multiple establishments allows for shipment consolidation. The framework also better represents the logistics decision-making process by distinguishing the behavior of single- and multi-establishment firms.

The research team used East Central Wisconsin as a study area, and developed empirical models for selected elements of the conceptual model that are significant to the production, attraction, spatial distribution, and modal split of freight movements.

The research team also performed a critical assessment of the East Central Wisconsin Regional Planning Commission (ECWRPC) freight demand model to determine practical and incremental ways of enhancing the forecasting accuracy and policy sensitivity of the existing model. As a result of this assessment, researchers were able to recommend that the ECWRPC calibrate the model with local data; refine industry classification in the trip generation equation; apply location-specific treatment in trip generation; incorporate additional variables in trip generation; adjust terminal time in trip distribution; refine truck conversion in traffic assignment; adjust convergence criteria in traffic assignment; and, incorporate a modal split model component in the plan. The study team also outlined two modeling approaches as alternatives to the existing model: the first a community-based model and the second a simplified version of the firm-based conceptual model investigated in this study. The latter would require further investigation and evaluation.

For more information about this project and to consult the final report, visit cfire.wistrans.org/research/projects/02-06.

MAFC extended through 2015

At the recent meeting of the Mid-America Association of State Transportation Officials (MAASTO), the Executive Committee of the Mid-America Freight Coalition (MAFC) authorized the Coalition for an additional three years, through 2015.

During these three years, the Mid-America Freight Coalition will focus on aligning it's research programs and it's regional freight study, currently underway, with the recently enacted Moving Ahead for Progress in the 21st Century (MAP-21) surface transportation bill.

"With the passing of MAP-21 into law, the emphasis on freight will only increase," said MAFC Program Manager Ernie Perry. "The history of collaboration in our region and the current efforts across the Mid-America states positions them well for moving forward in the world economy."

The Mid-America Freight Coalition will also expand its outreach efforts to include the chief engineers from the ten state departments of transportation in order to collaborate with them on innovative freight practices, trends, and policy options.

The ten member states each contribute $25,000 per year to the Coalition's pooled fund; the National Center for Freight and Infrastructure Research and Education (CFIRE) provides $250,000 per year. CFIRE will continue to provide coordination and member support for the Coalition.

Visit midamericafreight.org for the latest MAFC news.

The Effects of Overload Vehicles on Bridges

As industry grows and produces ever-larger items, the use of special purpose oversize and overweight (OSOW) vehicles to transport these items also continues to grow. An overweight vehicle crossing a bridge, even if it is a single crossing, may affect both the short-term behavior of the bridge, but also it's long-term performance and life-cycle cost. However, special permits are issued by state DOTs to overload vehicles without factoring in these cumulative, long-term effects.

A research team at the University of Wisconsin-Madison led by Dr. Michael Oliva recently completed the second phase of a CFIRE-funded project that analyzed and evaluated the effects of overload vehicles on bridges. This project aimed to help agencies in evaluating the long-term impact of vehicles on bridges so that they can assign the resulting costs to OSOW permit applicants.

Researchers used stress and cycles (S-N) relations and Miner's damage accumulation rule to calculate the damage to bridge components due to an overload and then used the life-cycle cost of a given bridge component and the damage accumulated to calculate an assigned cost per overload.

The project team applied this process for assigning cost for crossing bridges with overloads to two sets of examples as pilots: 1) two concrete decks and 2) two steel girder bridges.

For more information about this project and to consult the final report, visit cfire.wistrans.org/research/projects/02-03.

CFIRE Benefit-Cost Analysis Guide

CFIRE researchers recently published a guide entitled *Using Benefit-Cost Analysis for Evaluating Discretionary Transportation Infrastructure Investment*.

This guide uses Transportation Investment Generating Economic Recovery (TIGER) grant requirements as an example of using benefit-cost analysis (BCA) as a project selection tool. TIGER as a program relies on BCA as a selection criteria for grant recipients. Managers and analysts alike can use BCA guidance from the US DOT and the best practices of TIGER to create a more systematic and robust BCA. This guide applies a BCA framework to a TIGER grant application and uses it as the backbone for developing a compelling and competitive application. The guide follows a nine-step process for preparing a BCA and recommends where and how the results of each step should be incorporated into a TIGER grant application. The guide is informed by the long-term outcome criteria of TIGER, the BCA requirements of US DOT, and circulars on BCA by the Office of Management and Budget. The TIGER program provided funding for a variety of projects and its application requirements are a comprehensive example of what should be included in any infrastructure BCA.

The guide is available here: cfire.wistrans.org/documents/BCA_Guide.pdf.

Broad Economic Benefits of Freight Transportation Infrastructure Improvement

Improvements in freight infrastructure are often made in order to improve the efficiency of the transportation network. However, it's often unclear how to quantify the economic benefits of these infrastructure improvements.

Researchers recently completed a CFIRE-funded project that aimed to develop a methodology to estimate the broad economic benefits of improving the efficiency of trucking in urban areas. Dr. Kazuya Kawamura of the University of Illinois at Chicago led the project team, which also included researchers from the University of Toledo.

The research team developed an analytical framework for quantifying the broad economic benefits of transportation infrastructure projects. This framework is designed to be used with publicly available freight data. They also categorized the urban areas in the upper Midwest according to their economic structure, with a focus on the importance of freight-related industries in these urban areas.

Researchers then applied this framework to five regional economies for analysis: Toledo, Ohio; Detroit, Michigan; Milwaukee, Wisconsin; Chicago, Illinois; Minneapolis, Minnesota. This analysis measured both the short-term economic impact of investing in freight-dependent economies and the resulting permanent structural shift due to a change in demand.

For more information about this project and to read the final report, visit cfire.wistrans.org/research/projects/03-14.

Measuring VOD for Shippers

The late delivery of freight due to highway congestion and other factors increasingly affects private sector production, logistics, and shipping operations by increasing transportation costs.

A joint research team from CFIRE and the University Transportation Center for Mobility (UTCM) at Texas A&M University recently completed a CFIRE-funded project that focused on developing a model for estimating the value of delay (VOD) for highway freight shippers. CFIRE Director Teresa Adams and UTCM's Dr. Bruce Wang served as primary investigators for this project.

Freight delay affects shippers in many ways, including their decisions about safety stock in inventory. For shippers operating a just-in-time system, freight delays cause losses in productivity and even losses in sales. Past studies have also considered the perceived value of time for commuters and commercial drivers, but little research has focused on the value of delay (VOD) from the perspective of shippers. The cost of freight delay is usually measured as a monetary value in U.S. dollars.

This project aimed to study how freight delay incurs costs to shippers and how these costs vary with the shippers operational characteristics. The research team used individual interviews, surveys, and an analytical study of inventory management.

The results of these analyses indicate that en route transportation delay is the most important component of delay, followed by delay at the item collection point. Delay at transfer points is not considered significant, perhaps because direct shipping bypasses distribution centers. Regression tests indicated a value of delay of $56 per hour when all participants are included. Researchers also obtained values of delay for nine industry groups, with two different demand and lead time patterns, and two different types of services.

For more information about this project and to consult the final report, visit cfire.wistrans.org/research/projects/04-14.

Table 7.1 Range of Values of Delay for Mean Transit Time

	REPRESENTATIVE INDUSTRY								
	Chemical	Food	Auto	Clothing	Other Mfg.	Pharma-ceuticals	Paper	Electronics	Merchan-dise
Range ($/hr)	3.97 | 22.27	2.39 | 11.10	1.44 | 5.44	1.04 | 3.43	0.86 | 3.40	0.49 | 2.67	0.39 | 2.05	0.34 | 1.68	0.25 | 0.76
Avg. ($/hr)	**13.89**	**7.24**	**3.61**	**2.34**	**2.23**	**1.67**	**1.31**	**1.06**	**0.53**

Table 7.2 Range of Values of Delay Based on Transit Time Variation

	REPRESENTATIVE INDUSTRY								
	Chemical	Food	Auto	Clothing	Other Mfg.	Pharma-ceuticals	Paper	Electronics	Merchan-dise
Range ($/hr)	20.27 | 46.08	5.94 | 26.95	6.99 | 10.29	4.77 | 7.21	5.35 | 6.27	2.40 | 3.87	1.95 | 4.53	2.74 | 3.89	1.94 | 2.69
Avg. ($/hr)	**31.04**	**13.49**	**8.41**	**5.74**	**5.77**	**3.03**	**2.99**	**3.29**	**2.21**

2013 MAFC/ITTS/KYTC Joint Annual Freight Meeting

MID-AMERICA FREIGHT COALITION

INSTITUTE FOR TRADE AND TRANSPORTATION STUDIES

KENTUCKY TRANSPORTATION CABINET

Building Paths to Prosperity: The Role of Regional Corridors

Sessions and Events

- State and MPO Working Sessions
- Freight Planning and Performance Measures
- Global Economic Implications for Freight
- Perspectives on MAP-21
- Industry Trends and Perspectives
- Practical Approaches to the New Economy
- Regional and Local Planning Approaches
- Tours of Kentucky Freight Facilities
- MAFC and ITTS Partner Sessions

The CFIRE-sponsored Summit on the Beneficial Use of Dredging Materials will also be held in conjunction with the 2013 MAFC/ITTS/KYTC Joint Annual Freight Meeting.

For updates about this event, visit midamericafreight.org/events/2013am/

Louisville, Kentucky ▪ March 12-14, 2013

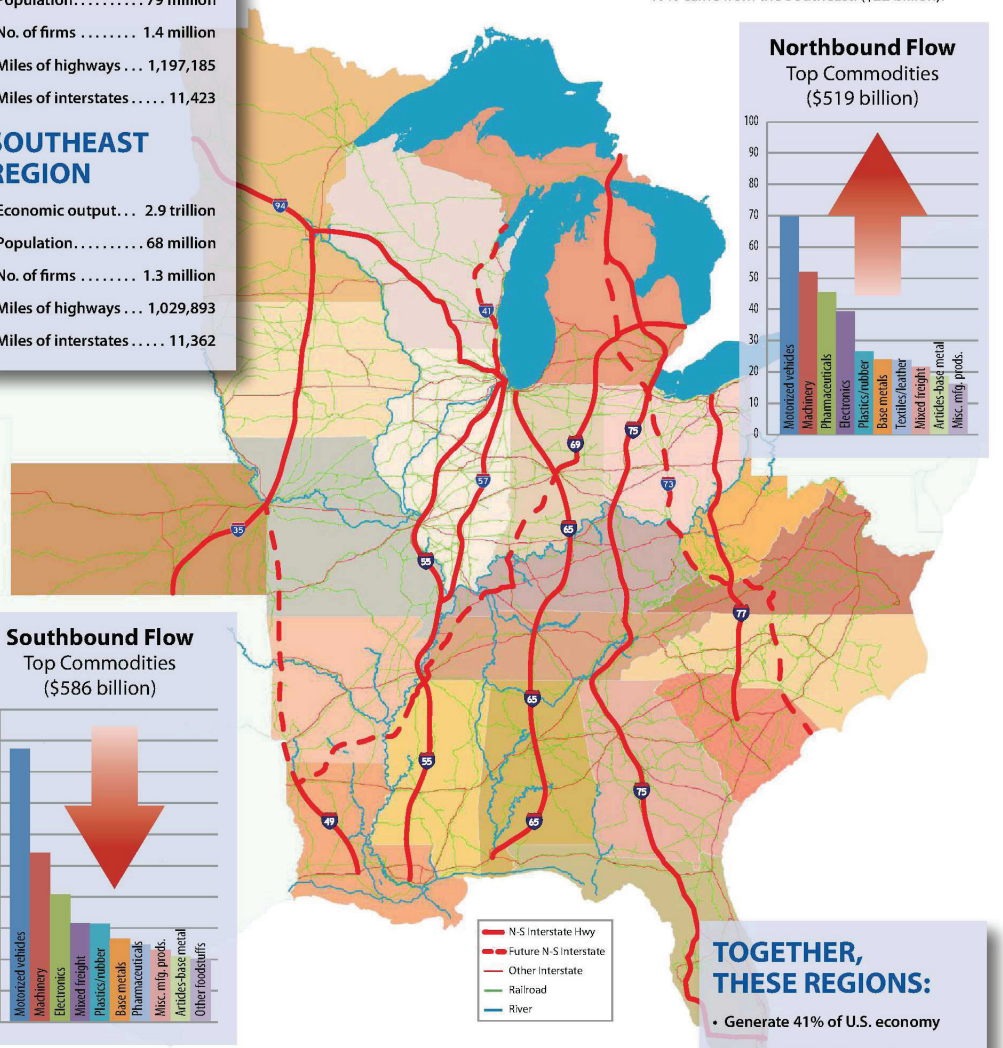
For more information about this conference, contact Ernie Perry (MAFC) at ebperry@wisc.edu or Bruce Lambert (ITTS) at bruce@ittsresearch.org.

MID-AMERICA - SOUTHEAST FREIGHT CORRIDORS
Critical to the Regions, Critical to the Nation

MID-AMERICA REGION
- Economic output... 3.2 trillion
- Population..... 79 million
- No. of firms ..... 1.4 million
- Miles of highways... 1,197,185
- Miles of interstates..... 11,423

SOUTHEAST REGION
- Economic output... 2.9 trillion
- Population..... 68 million
- No. of firms ..... 1.3 million
- Miles of highways... 1,029,893
- Miles of interstates..... 11,362

TRADE WITH CANADA
- Canada is largest trading partner for most states in region, especially with auto-producing states.
- Exports through Mid-America border crossings equaled $123 billion in 2011.
- 19% came from the Southeast: ($22 billion).



Northbound Flow
Top Commodities
($519 billion)

Southbound Flow
Top Commodities
($586 billion)

TRADE WITH SOUTHEAST GATEWAYS
- The Mississippi River serves as a major export gateway for agricultural products, but other gateways are just as important.
- Southeast gateways handled $244 billion in export trade.
- $32 billion (13%) had a Mid-American origin.

TOGETHER, THESE REGIONS:
- Generate 41% of U.S. economy
- Produce 38% of domestic energy
- Grow 48% of America's agriculture
- Ship 40% of the nation's exports
- Make 50% of U.S. manufacturing

The Mid-America freight coalition member states include:
Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Ohio, Wisconsin

ITTS member states include Arkansas, Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, West Virginia

Kentucky estimates are included in each regional summary, but are not double counted in the total figure.

INSTITUTE FOR TRADE AND TRANSPORTATION STUDIES
www.ittsresearch.org

MID-AMERICA FREIGHT COALITION
http://midamericafreight.org

Better Performing Bridge Approach Slabs

The transition between bridge approach slabs and the bridge deck itself often settle at different rates, causing a “bump” for motor vehicles and maintenance problems associated with approach slab deterioration.

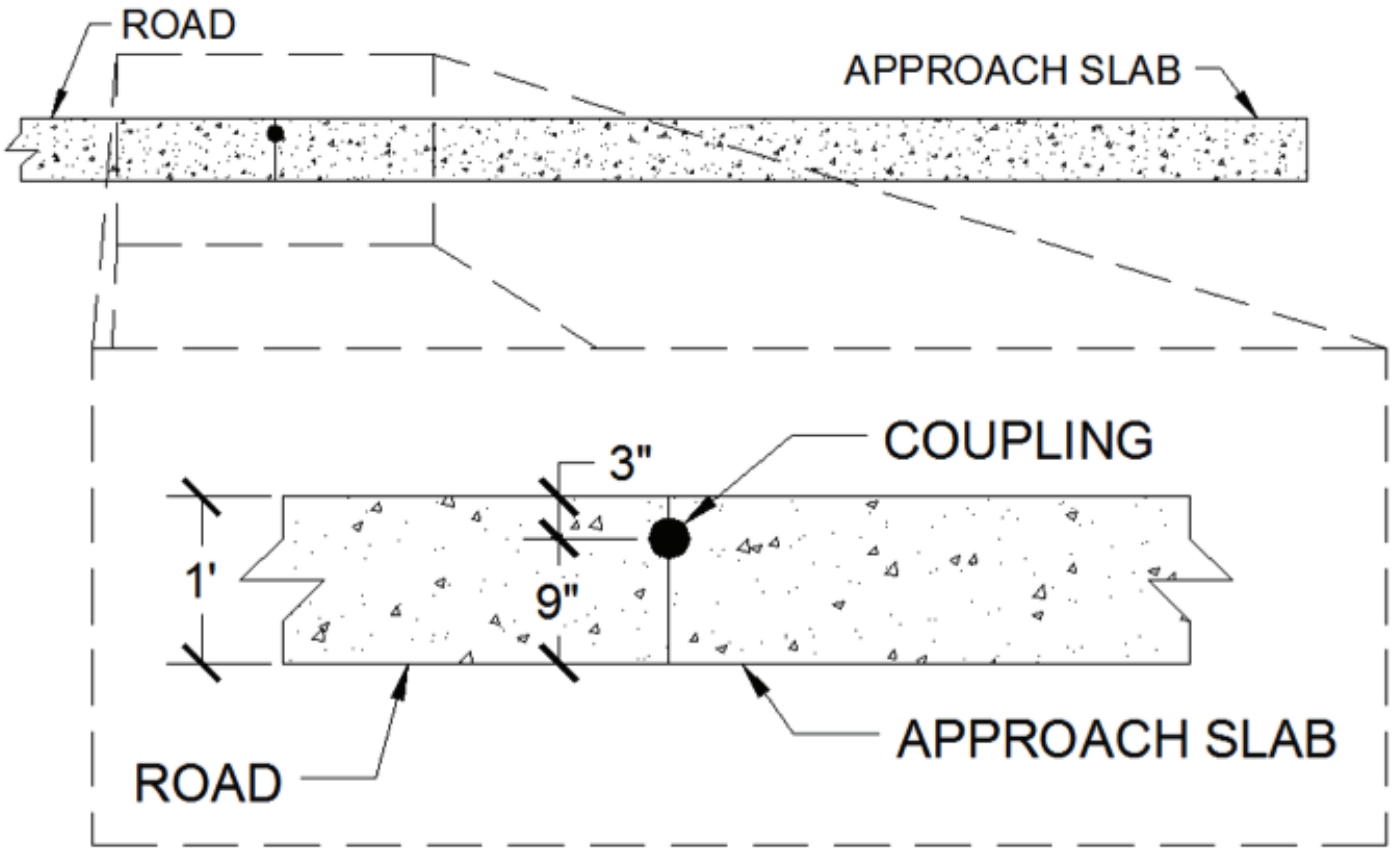
CFIRE affiliate researchers recently completed a CFIRE-funded project that aimed to improve the performance of highway bridge approach slabs by quantifying the amount of rotation that could develop between an approach slab after base settlement and a bridge abutment. CFIRE associate director Michael Oliva led the project.

The research team quantified the problems — particularly cracking and rotations — associated with approach slabs by analyzing a number of parameters including approach slab length, slab material, subgrade soil type, abutment height, and possible trenches that may develop under the slab near its support on the abutment.

As a result of these analyses, researchers reached conclusions about both approach slab end rotation and approach slab cracking. The end rotation of the approach slab near the abutment varied depending on geometry of the approach slab, trench and abutment as well as with the stiffness of the soil and concrete used in the analyses. The susceptibility of the approach slab to cracking was influenced by the height of the abutment, trench length, slab length, soil stiffness, and concrete stiffness. Taller abutments increase the likelihood of concrete cracking in the approach slab. The length of the approach slab has little effect on the likelihood of cracking or amount of end rotation for slabs greater than ten feet in length. Stiff soil under the approach slab reduced the probability of concrete cracking. The risk of concrete cracking increased as the soil stiffness decreased.

This information might be used to create a better approach-bridge transition using ductile concrete to directly connect the approach slab to the bridge deck.

For more information about this project and to read the final report, visit cfire.wistrans.org/research/projects/03-10.



CFIRE Year 7 Projects

Projects funded under the auspices of year 7 of CFIRE 1 have been selected and work is now underway.

CFIRE 07-01: Remediating Fouled Ballast and Enhancing Rail Freight Capacity

This project aims to assess the feasibility of strategically placed polyurethane-stabilized layers within the fouled ballast structure to remediate fouling impact, thus reducing maintenance life cycle costs and increasing load capacity.

CFIRE 07-02: Getting the Goods without the Bads: Freight Transportation Demand Management Strategies to Reduce Urban Impacts

This study will evaluate freight transportation demand strategies to reduce the economic, social, and environmental costs associated with goods movement in urban areas, which may involve pricing, routing, land use, and other strategies.

CFIRE 07-03: Anti-Icing and De-Icing Superhydrophobic Concrete to Improve the Safety on Critical Elements of Roadway Pavements and Bridges

This project aims to introduce and develop an effective anti-icing and de-icing superhydrophobic concrete and to assess the general feasibility of such a system through laboratory testing.

CFIRE 07-04: Assessing Sustainable Freight Policies Using Microsimulation Approach

This study aims to assess how freight policies could support achieving the sustainability objectives of transportation community. It tests different policy measures and discusses the potential changes in the impacts of freight transportation under each policy.

CFIRE 07-05: A Product-Specific Cold Chain Analysis for Regional Freight Integration into the Circle City and Beyond

This project aims to determine an existing cold chain context in the Driftless region, comprehend the existing logistical capacity in the regional food system, and perform a geospatial and market analysis of the local and regional food system to determine possible matching between producers, packers, and shippers, as well as prime locational possibilities for intramodal and intermodal packing and shipping facilities.

CFIRE 07-06: Beneficial Use of Dredged Materials in Great Lakes Commercial Ports for Transportation Projects

This project aims to produce a set of guidelines for use of dredged materials in transportation-related projects, including geotechnical requirements and the locations within the Great Lakes from which dredged materials with these requirements may be sourced.

CFIRE 07-07: Network Travel Time Estimation for Freight Planning Using Entry-Exit Data

This study aims to develop a mechanism and analytical methodologies to estimate the network travel time for trucks, particularly in a congested area.

CFIRE 07-08: Characterizing Rider Safety in Terms of Asphalt Pavement Surface Texture

This project aims to characterize a significant number of conventional and non-conventional asphalt pavement mixtures to correlate surface texture with friction.

CFIRE 07-09: Advancing Asphalt Mixture Design through Application of Planar Imaging Techniques and Asphalt Lubricity Testing to Improve Understanding of Effects of WMA on Mixture Workability

This project aims to create a mix design guideline based on the concept of using asphalt binder thin film behavior to achieve a target aggregate structure that ensures a certain level of performance.

For more information about these and the rest of CFIRE's research, education, and outreach projects, visit cfire.wistrans.org/research/current-research/.

CFIRE Supports STEM at Camp Badger

Camp Badger Exploring Engineering is a one-week, residential program for Wisconsin and Minnesota teenagers entering 8th grade that helps students explore many types of engineering fields to interest them in education and careers in the STEM disciplines.

Camp Badger uses field trips, job site visits, hands-on activities, and small group discussions to teach young people about engineering. Campers live in undergraduate dorms on campus, eat at the university cafeteria, and are supervised by adult counselors who also share in their educational experience.

This year, CFIRE provided sponsorship for Camp Badger and created the curriculum for one day of the camp. This session focused on relating freight transportation to STEM fields and specifically dealt with moving freight by water, particularly through locks and canals. CFIRE researchers gave a presentation on maritime freight to two groups of 32 students, which explained the mechanisms and mechanics behind a lock system with a taunter gate.

"I really enjoyed talking to the young engineers about freight logistics and maritime transportation," said CFIRE research intern Josh Levine. "I hope that discussing the freight that travels via our waterways — and traversing the Tenney Locks — was as informative for them as it was for me."

Students then toured the local waterways via pontoon boat, which included a tour of a the lock facility on the Yahara River in Madison's Tenney Park. CFIRE also provided each student with a chart of the Madison chain of lakes (which doubled as a bandana).

The students also presented their experience to their peers and families on the last day of Camp Badger.

For more information about Camp Badger, visit campbadger.engr.wisc.edu.

Students Learn about Freight-based Economic Development

CFIRE recently sponsored a trip for a group of students from the University of Southern Mississippi to attend the Intermodal Freight Conference at the University of Memphis.

These students from the graduate programs in Economic Development and Logistics, Trade, and Transportation also met with students from the University of Memphis who are studying transportation engineering. They toured the CN/CSX Intermodal Yard and the adjacent Frank C. Pidgeon Industrial Park to learn about freight-based economic development.

Rapid Replacement and Construction of Bridges

Bridge construction and replacement, to a greater degree than highway repair, requires special planning, engineering, materials procurement, and longer periods of construction time.

CFIRE affiliate researchers recently completed a study in which they surveyed rapid bridge replacement and construction techniques and synthesized a series of best practices for rapid bridge replacement and construction in the United States. Researchers also developed a decision-making framework to help determine the feasibility of rapid replacement and construction methods in a given case.

Rapid bridge construction carries a number of potential benefits, including mobility improvements, safety enhancements, and mitigation of adverse effects on local businesses and communities. These construction methods depend on innovations such as new materials, prefabrication of bridge components, and new contracting processes. High performance concrete and steel are new materials that are commonly used in rapid bridge replacement/construction. Prefabrication is concentrated on the superstructure and deck. Innovative contracting methods primarily include incentives and disincentives, A+B, design-build, and lane rental.

The research team considered these factors when developing the decision-making framework for the rapid construction and replacement of bridges. This framework focuses on materials, prefabrication, machinery, and contracting. Rapid construction of a given bridge is justified, according to this framework, after confirming the criticality of the bridge, the contractor's prefabrication ability, the contractor's construction management, and the savings to the agency and to the roadway users. The research team developed a decision support system using the Analytical Hierarchy Process (AHP) to rank order bridges that have been identified for rapid replacement and construction.

For more information about this project and to consult the final report, visit cfire.wistrans.org/research/projects/02-02.

Areawide Truck Freight Values for the UMR

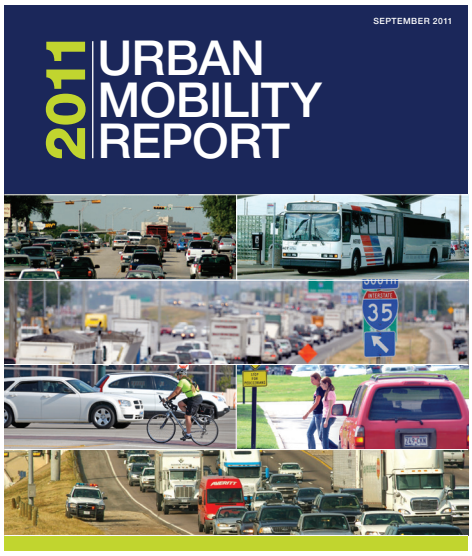
Knowledge about the effects of traffic congestion on the motoring public have improved steadily over the last twenty years, but the effect of congestion on urban freight movement is less understood.

CFIRE researchers recently completed a project in which they collaborated with a team from the Texas Transportation Institute on the Development of an Areawide Estimate of Truck Freight Value in the Urban Mobility Report (UMR). CFIRE Director Teresa Adams and former CFIRE Associate Director Jessica Guo served as the principle investigators for this project.

This project aimed to produce truck freight values for inclusion in the Urban Mobility Report. Researchers used the FHWA Highway Performance Monitoring System (HPMS) and the FHWA Freight Analysis Framework (FAF) for their analysis. The project team developed and tested, using the Milwaukee area as a test case, a transferrable method for investigating freight value along specific corridors in urban areas.

Researchers first used this method to include truck freight values in the 2010 Urban Mobility Report. The 2011 edition of the UMR used a similar methodology to present truck freight values. Researchers will continue to include these data in future editions of the UMR.

For more information about this project and to consult the final report, visit cfire.wistrans.org/research/projects/04-16.



Texas Transportation Institute · POWERED BY INRIX TRAFFIC · UTCM University Transportation Center for Mobility

For more information about the Urban Mobility Report, visit mobility.tamu.edu.

Wisconsin Large Truck Safety Study

CFIRE affiliate researchers recently completed a project in which they examined large truck safety in Wisconsin by analyzing truck crash data from several federal and state databases and information sources.

The Wisconsin Large Truck Safety and Enforcement Study (LTS&E) is the result of an integrated effort with the Wisconsin Traffic Operations and Safety Laboratory (TOPS Lab) and Wilbur Smith & Associates together with C J Petersen & Associates and focused on a system-wide evaluation of large truck safety in the state of Wisconsin.

Researchers also conducted interviews with county transportation officials to learn about the potential engineering-related reasons for the crashes.

The primary focus of the safety evaluation and recommendations for engineering countermeasures is on large truck configurations. Most crash reports for large trucks are based upon their being defined as commercial motor vehicles which for crash reporting purposes are generally defined as vehicles with a gross vehicle weight of 10,000 pounds or more. The analysis also broadly examines OS/OW truck operations, defined as those vehicles requiring a permit per state regulations to travel within Wisconsin.

Based on these analyses, the project team issued a series of key findings about the safety of large commercial motor vehicles (CMVs) in Wisconsin.

- CMV fatal crash rates are declining in Wisconsin, the Midwest, and nationally.
- Wisconsin is safer than the national average when considering truck crashes.
- Large truck crashes are more prevalent in rural areas in Wisconsin than they are nationally.

For more information about this project and to consult the final report, visit cfire.wistrans.org/research/projects/04-24.

WISCONSIN TOPS
TRAFFIC OPERATIONS & SAFETY LABORATORY

2012 Student of the Year

Dan Moser has been named the 2012 CFIRE Student of the Year in Transportation.

Dan Moser is pursuing a master's degree in the La Follette School of Public Affairs and a certificate in Transportation Management and Policy through the Nelson Institute of Environmental Studies. He is a returning student and UW-Madison alumnus, having received an MS in urban and regional planning from the University of Wisconsin-Madison in 1997. Dan has worked as an urban planner in both the public and private sectors, specializing in land use and growth management. He is also a veteran of the U.S. Army and Wisconsin Army National Guard, and was deployed to Iraq in 2003-2004.

Dan's primary professional and academic interests include policies and management practices that promote more environmentally sustainable, equitable, and efficient land use and transportation systems, particularly in urban settings. In addition to his studies, Dan works as a part-time research assistant at CFIRE. His CFIRE research includes a study of waterborne freight on inland waterways and the Great Lakes for the Mid-America Freight Coalition's regional freight study. Dan also serves on the UW-Madison Student Transportation Board. After graduation, Dan hopes to pursue a career in transportation policy.

This award will be presented at the Council of University Transportation Centers Annual Awards Banquet to be held on January 13, 2013 in Washington, DC.

Janowiak Hired by WisDOT

CFIRE project assistant Scott Janowiak was recently hired by the Wisconsin Department of Transportation. He will work as a program and policy analyst in the Division of Transportation Investment Management, Bureau of State Highway Programs. In this role, he will serve as the central coordinator for the Highway Safety Improvement Program (HSIP).

During his time at CFIRE, Janowiak worked mainly on two research projects: Maintenance Quality Peer Exchange 2 (MRUTC 08-15) and Air Cargo in the Mid-America Freight Coalition (CFIRE 04-11). In addition, he played a key role in the organization of the 2012 National Transportation Workforce Summit.

Janowiak graduated in Spring 2012 with a Master's degree in Urban and Regional Planning with a certificate in Transportation Management and Policy from the University of Wisconsin-Madison. He was also the recipient of the 2012 Muzi Fellowship.

"It's important for engineers, planners, and policy analysts to understand each other's language," said Janowiak. "CFIRE and TMP have given me the tools to learn these languages and translate between them. CFIRE and TMP form a solid foundation of transportation knowledge and experience I can reference as I begin my career."

Join us in congratulating Scott Janowiak as he starts his new position.

CFIRE Support for Rail Scholarships

CFIRE has teamed up with the University of Wisconsin–Madison Department of Engineering Professional Development to offer a second round of scholarships for rail-related short courses.

In the Fall of 2012, there were two courses eligible for CFIRE scholarships.

- Railway Bridge Engineering (October 8-9, 2012 in Madison, WI)
- Fundamentals of Railway Train Control and Signaling, Including PTC Systems (November 5-6, 2012 in Madison, WI)

One participant noted that the scholarship afforded their agency a "great opportunity to enhance our knowledge of railway bridges."

In many cases, the CFIRE scholarships provide one of the few ways for public-sector employees to attend these courses.

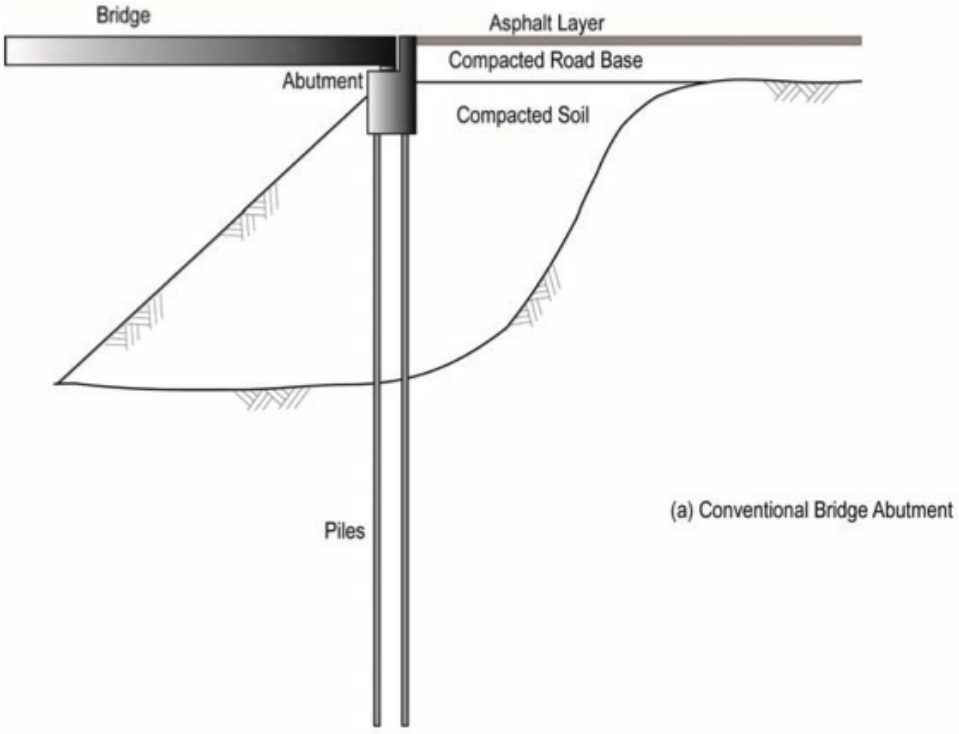
These courses were held in Madison, Wisconsin on the UW-Madison campus. Successful applicants receive a CFIRE full tuition scholarship to attend one of these UW short courses.

Novel Bridge Abutments using CLSM

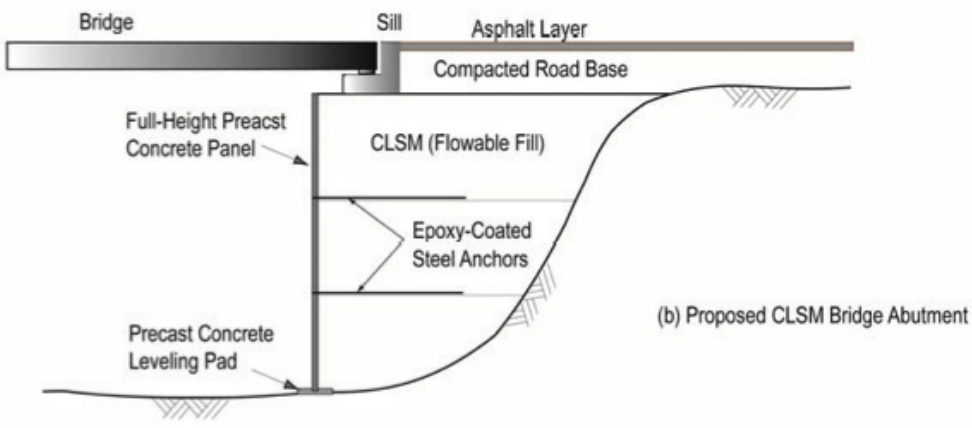
The construction of bridge abutments and their deep foundations is time-consuming and costly. This is one of the major obstacles that faces rapid bridge construction for typical span bridges used in railway and highway applications.

Researchers at the University of Wisconsin-Milwaukee and the University of Wisconsin-Madison have recently completed a CFIRE-funded project that examined the use of controlled low strength materials (CLSM) for constructing bridge abutments. This study aimed to examine the application of CLSM bridge systems in typical span bridges used in railroad and highway situations.

The CLSM bridge abutment under study is composed of full-height precast concrete panels attached to a CLSM backfill via epoxy-coated steel anchors. The CLSM bridge abutment provides a load-bearing mechanism for the bridge sill, eliminating the need for piling. The CLSM abutment itself does not require the use of a deep foundation, even if the underlying soil is weak. If the foundation soil is unacceptable, a flowable fill foundation may be used to provide a stronger platform for the construction.



(a) Conventional Bridge Abutment



(b) Proposed CLSM Bridge Abutment

The project team tested the mechanical properties of numerous CLSM mixes, including compressive strength, flow consistency, and the pullout strength of rebar embedded in CLSM. Based on these tests, they selected a CLSM mixture with a flow rate of 14 inches and a seven-day compressive strength of 55 psi.

Researchers then conducted a full-scale laboratory test on an instrumented abutment to determine the constructability of the proposed CLSM abutment and its load-carrying capacity and deformations after seven days of CLSM setting time.

The results of these tests show that a CLSM bridge abutment with a curing time of seven days is capable of carrying bridge loads with a reasonably large safety margin and with minimal deformations. With these encouraging results, the research team recommends a full-scale field demonstration of a CLSM bridge system to demonstrate its feasibility as a rapid bridge construction method.

For more information about this project and to consult the final report, visit cfire.wistrans.org/research/projects/03-12.

Impact of Overweight Vehicles on Bridge Deck Deterioration

The heavy axle loads and large gross weight of some trucks can create micro-cracks in and accelerate the deterioration of concrete bridge decks.

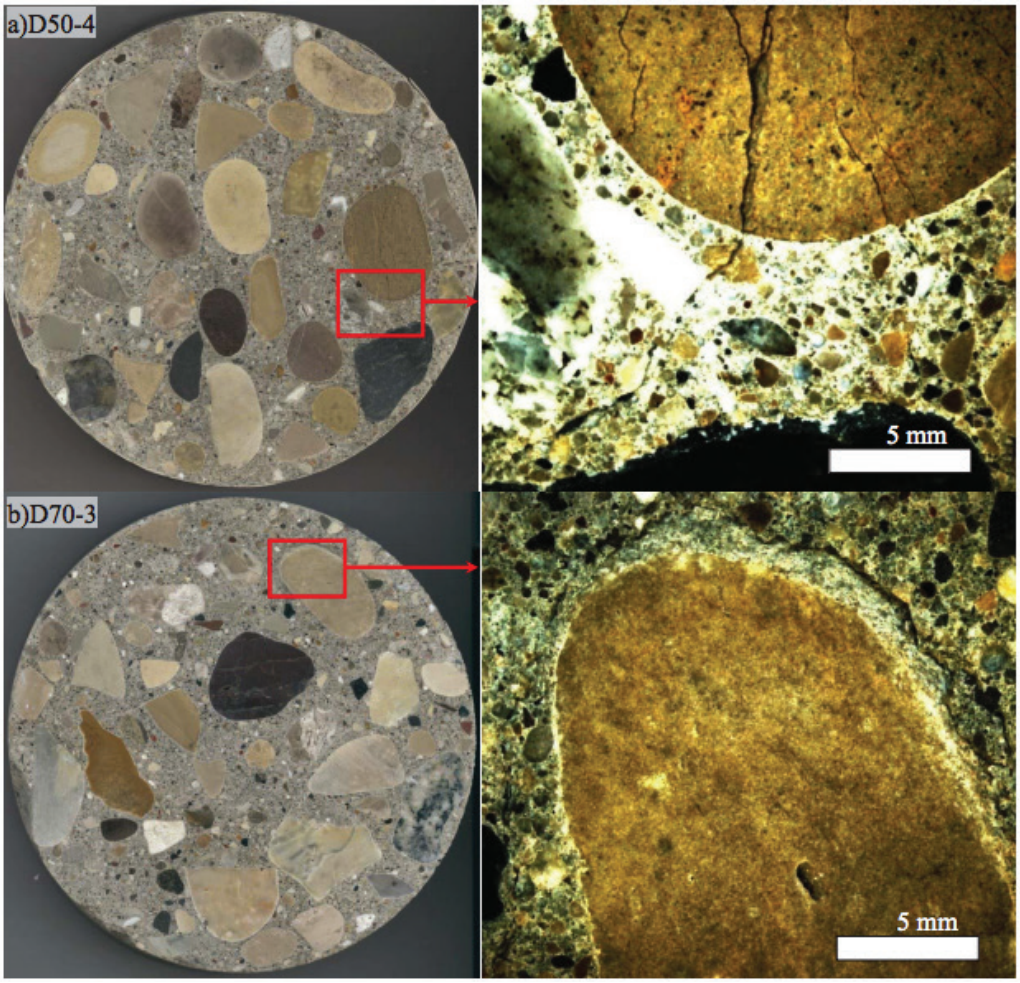
Researchers have recently completed a CFIRE-funded project that investigated and quantified the impact of overweight vehicles with heavy axle loads on bridge decks using laboratory tests and numerical simulations. This study, entitled Impact of Overweight Vehicles (with Heavy Axle Loads) on Bridge Deck Deterioration, was conducted by a project team at the University of Wisconsin-Milwaukee and led by Dr. Jian Zhao.

The research team conducted a series of laboratory tests that evaluated the combined mechanical stresses and freeze-thaw cycles on the durability of air-entrained concrete, which is widely used for bridge construction in Wisconsin. Concrete cylinders were cured in limewater for 28 days, then subjected to predefined compressive loads, 300 freeze-thaw cycles, and tested for rapid chloride ion penetrability tests. Test results indicated that the micro-cracks that resulted from mechanical loading combined with freeze-thaw cycles significantly increased the permeability of air-entrained concrete and may accelerate the deterioration of concrete elements such as bridge decks. These test results were confirmed using scanning electronic microscopic images of loaded and unloaded specimens.

However, the complex stresses of a bridge deck under vehicular load were not simulated by these permeability tests. Instead, numerical bridge deck analyses were conducted to investigate stress distributions and stress levels in typical concrete bridge decks subjected to high axle loads. These numerical analyses, which used idealized bridge models, focused on compressive stresses in both longitudinal and transverse directions and the resulting minimum principal stress developed on top of concrete deck slab. These analyses indicated that the normal stress in bridge decks in the transverse direction can be significantly affected by the thickness of bridge deck, the girder spacing, and the magnitude of the wheel loads. In addition, the stress contours indicated that the normal stresses in the longitudinal and transverse directions are not highly coupled.

As a result of these tests, the project team found that overweight trucks may cause an increase of more than 50 percent in the minimum principal stress on the top of a concrete bridge deck slab. Such an overweight truck also causes higher bending moments in the bridge superstructure, which leads to higher longitudinal normal stresses. These combined stresses can cause the sort of micro-cracks found in the laboratory tests.

For more information about this project and to consult the final report, visit cfire.wistrans.org/research/projects/04-06.



Student Freight Symposium

CFIRE is sponsoring a Student Freight Symposium on February 5-6, 2013 in Memphis, Tennessee. This symposium is hosted by the Intermodal Freight Transportation Institute (IFTI) at the University of Memphis.

The Student Freight Symposium provides an opportunity for students to showcase their research, connect with industry experts, network with their peers, and tour local freight facilities. The students that attend this symposium will help form the next generation of freight leaders.

We invite undergraduate and graduate students to submit abstracts in all areas of freight transportation, logistics, and supply chain management for presentation during the Student Freight Symposium. Topics of interest include (but are not restricted to):

- Freight transportation: rail, motor carriers, maritime, air;
- Intermodal transportation;
- City logistics/urban freight;
- Urban freight performance
- Urban freight policy and planning
- Humanitarian and emergency logistics;
- Freight network design and planning;
- Intermodal/transmodal terminals;
- Intelligent transportation systems; for freight transportation;
- Integrated planning of people and freight transportation systems
- Simulation and freight transportation;
- Evaluation of public policies;
- Supply chain management;
- Public private partnership for financing freight projects;
- Robust and/or resilient design of supply chain networks.

The Student Freight Symposium is held in conjunction with a freight Workforce Summit. The two programs will be integrated to provide students with opportunities to interact with transportation professionals in both the private and public sectors.

Submissions are open to students enrolled in an academic institution during the Spring and/or Fall semester of 2012. Please submit an abstract (maximum of 500 words) via email to Keith Story (kstory1@memphis.edu) with subject: "Student Symposium".

Submission Deadline: January 20th, 2012

For more information, contact Sean Ellis at (901) 678-2837 or visit the conference website: http://www.memphis.edu/ifti/events_pages/research_symposium.php.

Freight Workforce Summit

CFIRE is sponsoring a Freight Workforce Summit on February 5-6, 2013 in Memphis, Tennessee. This event is hosted by the Intermodal Freight Transportation Institute (IFTI) at the University of Memphis.

The Freight Workforce Summit provides an opportunity for private industry, public sector and academic institutions to discuss the growing workforce challenges facing this industry. We will discuss this critical issue with the intention of finding real solutions to a national problem. We want you to be part of the conversation. CFIRE will provide academic representation from a wide range of academic disciplines and universities.

The Freight Workforce Summit is held in conjunction with a national student symposium on freight. The two programs will be integrated to provide industry with opportunities to interact with some of the best transportation students from across the nation at both the undergraduate and graduate level. Each Freight Workforce Summit participant will be provided a book of resumes from students who are participating in the student symposium. The agenda provides plenty of time for the two groups to interact which will hopefully lead to future job opportunities.

To reserve a spot for your company or to find out more about this event, please contact Sean Ellis at (901) 678-2837 or email at scellis1@memphis.edu.

For more information, visit the Freight Workforce Summit page: http://www.memphis.edu/ifti/events_pages/workforce_summit.php.

THE UNIVERSITY OF MEMPHIS®

Intermodal Freight Transportation Institute

Save the Date!

Summit on the Beneficial Use of Dredged Materials

Turning a Surplus Material into a Commodity of Value

LOUISVILLE, KENTUCKY — MARCH 14-15, 2013

About the Summit

This summit will explore the use of dredged materials in state transportation projects and in other beneficial ways, as both a sustainable dredging strategy, and an opportunity to utilize a readily available commodity.

Who Should Attend?

The summit is open to all interested attendees, but focuses on issues important to state department of transportation engineers, including chief engineers, materials engineers, and geotechnical engineers.

Conference Themes

- Economic impact of the disposal problem
- State of the art of the beneficial use
- Beneficial use in practice
- Opportunities for departments of transportation
- Federal and state policy and regulatory perspectives
- Tools for finding available dredged materials
- The future of beneficial use of dredged materials

For more information about this summit, visit cfire.wistrans.org/events/dredging/

About CFIRE

You are invited to the

2013 Wisconsin Transportation Reception

During the TRB Annual Meeting

HOSTED BY

Transportation Development Association

Sunday, January 13, 2013
5:30 p.m.—7:30 p.m.
Marriott Wardman Park Hotel
Thurgood Marshall Ballroom East
2660 Woodley Road, NW
Washington, D.C.

2013 Sponsors

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- Modified Asphalt Research Center
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- TransSmart Technologies

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