



2010 ANNUAL REPORT

LOOK UP
HANG UP
SLOW UP



Greg Wood

THE ACCIDENTAL MESSENGER



In the 26 years he has worked in road construction traffic control, Greg Wood never pictured himself speaking publicly about the dangers of highway construction zones—until he became an accident statistic himself.

Late on a Friday night in March 2009, Greg was working on the Interstate 77 widening project when he was struck from behind by an impatient, and allegedly impaired, driver who blew through the work zone and just kept going.

“With the sounds of traffic and construction equipment, I never heard him coming into my work zone,” says Greg. “The impact threw me 26 feet in the air. The impact changed my life in ways I never could have imagined.

When I regained consciousness, I was lying in the roadway in the path of oncoming traffic. I tried to move, but both my legs were broken, and the ringing in my ears so deafening I could barely hear myself think. With headlights bearing down on me, I said a prayer asking God to save me, then closed my eyes.

Miraculously, I awakened hours later in the hospital after three hours of surgery to piece my legs back together with rods, pins and screws; treat my broken ribs, left shoulder and tailbone, and put a cast on my left foot, which was crushed, and is now permanently damaged.”

The police caught up to Kyle Ross, 28, three days later at a car dealership where he had taken his car for repair. He claimed that he thought he had hit an orange barrel, and admitted that he was returning home from a bar when the accident occurred. Ross pleaded guilty to aggravated vehicular assault and failure to stop for an accident and was sentenced to 18 months in jail, five years probation, and 500 hours of community service.

At his sentencing, Judge Joan Synenberg chastised Ross, saying, “You gambled and Mr. Wood lost. What is most frustrating is that you call this an accident. I call this avoidable and completely irresponsible.”

After nearly two years of painful setbacks and physical rehabilitation, Greg Wood is back to work, thankful to be alive.

This accidental messenger has an important message for all: “Safety in work zones is a two-way street. Workers and drivers both need to do their parts to make sure everyone gets home safely.”



Steven C. LaTourette

Member of Congress

Dear Dr. Duffy:

The establishment of Cleveland State University's University Transportation Center is a source of great pride to me, and the accident involving Greg Wood illustrates how important it is to protect those who work improving our highways, roads and bridges in work zones.

Accidents like the one involving Greg Wood should not happen. Drunk driving, distracted driving, aggressive driving, and speeding can have deadly consequences. It's a miracle that Greg Wood survived.

There's no reason for anyone to die or be injured in a clearly marked work zone, yet more than 200 people have died in the last decade doing their jobs, and Ohio has seen 5,000 accidents in work zones in just a year's time. The familiar orange barrels are there for a reason--to keep drivers and workers safe. Motorists need to heed signs about speed limits in work zones, and be extra alert.

CSU's University Transportation Center is the nation's leader in finding ways to make these work areas as safe as possible. I applaud the engineers and researchers at CSU who work tirelessly on this vital mission. Their important work is making a difference in Ohio and around the nation.



Sincerely,

A handwritten signature in black ink, appearing to read "S. LaTourette".

Steven C. LaTourette
Member of Congress

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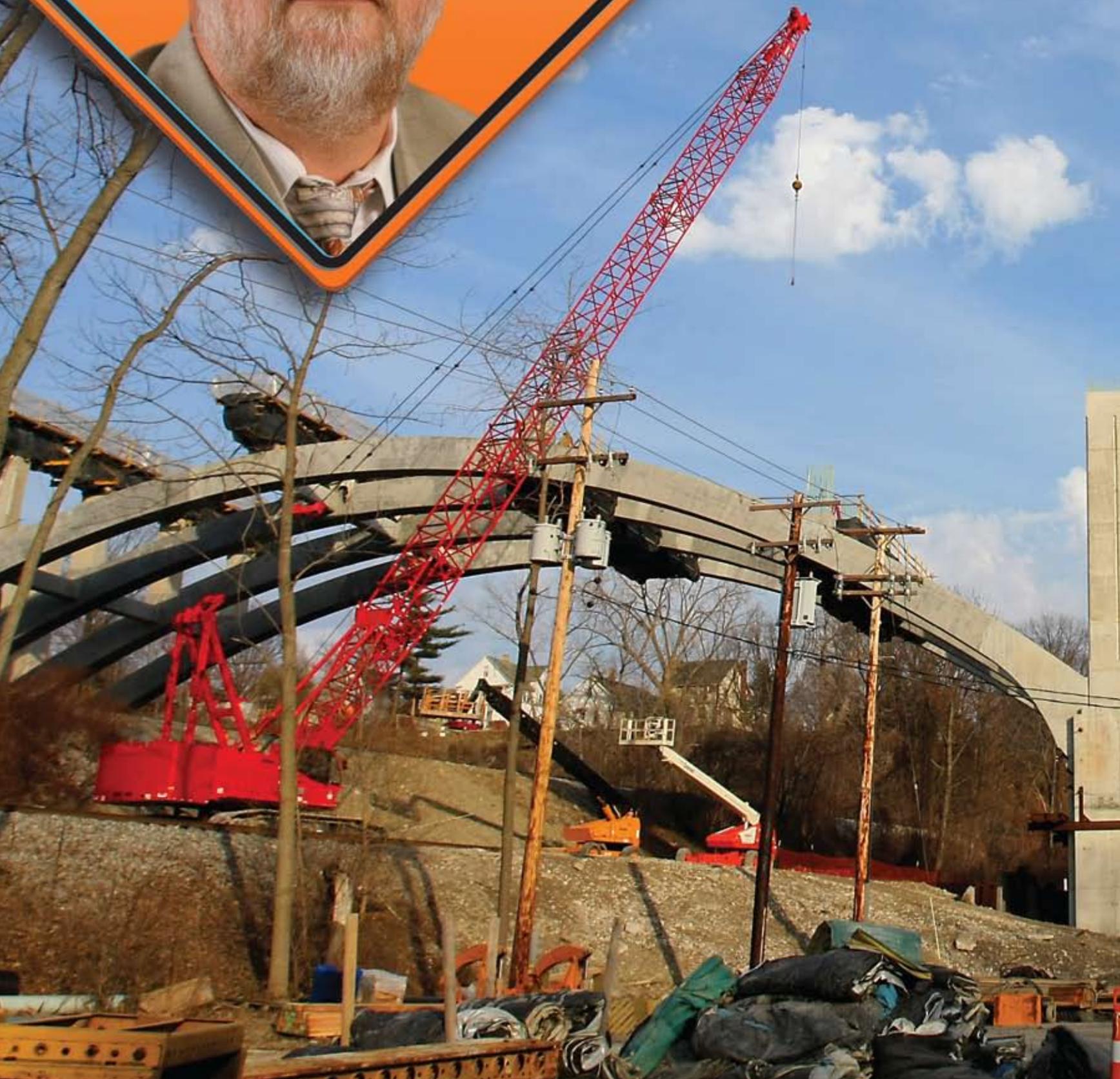
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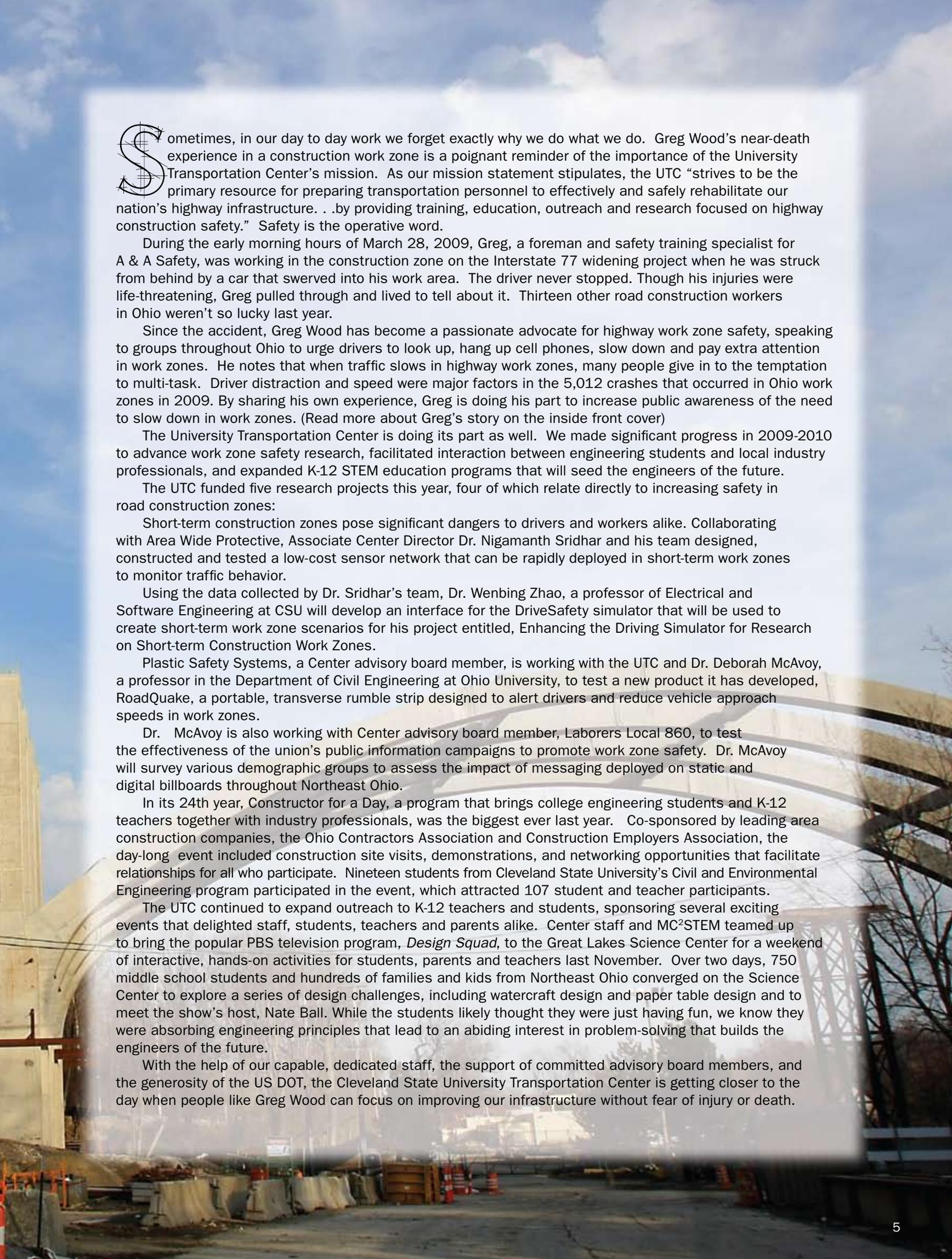


Director's Message

Center Director

Prof. Stephen F. Duffy PhD, PE, F.ASCE





Sometimes, in our day to day work we forget exactly why we do what we do. Greg Wood's near-death experience in a construction work zone is a poignant reminder of the importance of the University Transportation Center's mission. As our mission statement stipulates, the UTC "strives to be the primary resource for preparing transportation personnel to effectively and safely rehabilitate our nation's highway infrastructure. . .by providing training, education, outreach and research focused on highway construction safety." Safety is the operative word.

During the early morning hours of March 28, 2009, Greg, a foreman and safety training specialist for A & A Safety, was working in the construction zone on the Interstate 77 widening project when he was struck from behind by a car that swerved into his work area. The driver never stopped. Though his injuries were life-threatening, Greg pulled through and lived to tell about it. Thirteen other road construction workers in Ohio weren't so lucky last year.

Since the accident, Greg Wood has become a passionate advocate for highway work zone safety, speaking to groups throughout Ohio to urge drivers to look up, hang up cell phones, slow down and pay extra attention in work zones. He notes that when traffic slows in highway work zones, many people give in to the temptation to multi-task. Driver distraction and speed were major factors in the 5,012 crashes that occurred in Ohio work zones in 2009. By sharing his own experience, Greg is doing his part to increase public awareness of the need to slow down in work zones. (Read more about Greg's story on the inside front cover)

The University Transportation Center is doing its part as well. We made significant progress in 2009-2010 to advance work zone safety research, facilitated interaction between engineering students and local industry professionals, and expanded K-12 STEM education programs that will seed the engineers of the future.

The UTC funded five research projects this year, four of which relate directly to increasing safety in road construction zones:

Short-term construction zones pose significant dangers to drivers and workers alike. Collaborating with Area Wide Protective, Associate Center Director Dr. Nigamanth Sridhar and his team designed, constructed and tested a low-cost sensor network that can be rapidly deployed in short-term work zones to monitor traffic behavior.

Using the data collected by Dr. Sridhar's team, Dr. Wenbing Zhao, a professor of Electrical and Software Engineering at CSU will develop an interface for the DriveSafety simulator that will be used to create short-term work zone scenarios for his project entitled, Enhancing the Driving Simulator for Research on Short-term Construction Work Zones.

Plastic Safety Systems, a Center advisory board member, is working with the UTC and Dr. Deborah McAvoy, a professor in the Department of Civil Engineering at Ohio University, to test a new product it has developed, RoadQuake, a portable, transverse rumble strip designed to alert drivers and reduce vehicle approach speeds in work zones.

Dr. McAvoy is also working with Center advisory board member, Laborers Local 860, to test the effectiveness of the union's public information campaigns to promote work zone safety. Dr. McAvoy will survey various demographic groups to assess the impact of messaging deployed on static and digital billboards throughout Northeast Ohio.

In its 24th year, Constructor for a Day, a program that brings college engineering students and K-12 teachers together with industry professionals, was the biggest ever last year. Co-sponsored by leading area construction companies, the Ohio Contractors Association and Construction Employers Association, the day-long event included construction site visits, demonstrations, and networking opportunities that facilitate relationships for all who participate. Nineteen students from Cleveland State University's Civil and Environmental Engineering program participated in the event, which attracted 107 student and teacher participants.

The UTC continued to expand outreach to K-12 teachers and students, sponsoring several exciting events that delighted staff, students, teachers and parents alike. Center staff and MC²STEM teamed up to bring the popular PBS television program, *Design Squad*, to the Great Lakes Science Center for a weekend of interactive, hands-on activities for students, parents and teachers last November. Over two days, 750 middle school students and hundreds of families and kids from Northeast Ohio converged on the Science Center to explore a series of design challenges, including watercraft design and paper table design and to meet the show's host, Nate Ball. While the students likely thought they were just having fun, we know they were absorbing engineering principles that lead to an abiding interest in problem-solving that builds the engineers of the future.

With the help of our capable, dedicated staff, the support of committed advisory board members, and the generosity of the US DOT, the Cleveland State University Transportation Center is getting closer to the day when people like Greg Wood can focus on improving our infrastructure without fear of injury or death.



The first annual Work Zone Safety Awareness Week Rally and Memorial event brought UTC staff, advisory board members, engineering and construction firms, labor, students and faculty together with members of the public and media to kick off the road improvement season with a safety message for the public, “Look up, hang up, slow up” in road work zones.

Hundreds of participants gathered on April 19, 2010 on the Cleveland State University campus to remember those killed and injured in the 5,012 crashes in Ohio road work zones in 2009, and to prepare for a safe and successful 2010 road construction season.

Featured speaker Greg Wood provided personal testimony to the importance of obeying the call to look up, hang up and slow up in road construction areas. Wood, a foreman and safety training specialist with A & A Safety, was in the construction zone for the Interstate 77 widening project on March

28, 2009 when he was struck from behind by a car that swerved into his work area. The impact threw him 26 feet and left him with both legs broken, a crushed left foot, broken ribs, and chipped teeth.

Wood told the crowd that when traffic starts to slow down, people often use the opportunity to multi-task, increasing the likelihood of accidents. He urged the public to look up, hang up cell phones, slow down and pay extra attention in work zones.

The rally, hosted by CSU’s Transportation Center, was part of a coordinated campaign by departments of transportation in all 50 states in April to recognize National Work Zone Safety Awareness Week, a coast-to-coast effort to reduce accidents in highway construction zones.

To bring attention to motorist and worker safety in construction zones, the Ohio Department of Transportation (ODOT) and the Ohio chapter of the American Traffic Safety Services Association (ATSSA)

EXIT 161B

Transportation
Center
Cleveland State
University

Work Zone Safety
Awareness Week

distributed posters and provided orange wrist bands to ODOT employees, and Laborers Local 860 sponsored electronic message boards to relay the message, "Slow for the Cone Zone" to employees, contractors and the motoring public.

Noting that Cleveland State University's UTC has a unique focus on work zone safety, and that his team of researchers is studying the causes of crashes to improve conditions in the future, center director Dr. Stephen Duffy said, "Our work is focused on making sure that road workers like Greg Wood can perform their work safely, and that motorists are protected as well. The UTC is committed to developing technology that will advance safety in all transportation construction zones in our country, saving lives of workers and drivers."

Left to right:
Dr. Stephen Duffy,
Anthony Liberatore,
Lt. James Sivak,
Jolene Molitoris,
Greg Wood.





2010 Research Projects

A Distributed Instrument for Measuring Traffic in Short-Term Work Zones

In this project, Dr. Nigamanth Sridhar, a professor of Electrical and Software Engineering at CSU and an Associate Center Director, and his research team designed, constructed, and tested a low-cost sensor network instrument that can be easily and rapidly deployed in short-term work zones to monitor traffic behavior. Because the sensor network solution is completely self-organizing, and can begin producing useful data in a matter of minutes, it is uniquely suitable for use in short-term work zones. The software infrastructure they are building for this sensor network solution is capable of producing a variety of rich traffic statistics, such as vehicle speeds, vehicle trajectories, and behavioral trends, in real time. Dr. Sridhar's team collaborated with Area Wide Protective to deploy the network in short-term duration work zones.

Project funding from August 15, 2009 - May 15, 2010

Amount: \$30,404

Middle School Teachers and Graduate Students Partner to Incorporate Engineering

Middle School Mathematics and Science Classrooms Professor Debbie Jackson, from the CSU College of Education and Human Services, and an Associate Center Director, directed the classroom interaction of an engineering graduate student with one or two middle school mathematics and science teachers. The goal of the project was to embed engineering principles in mathematics and science classrooms. Specifically, the graduate student designed and co-taught a problem-based learning unit aligned with the Ohio Academic Content Standards. The graduate student also assisted as the opportunity arose and was a source for engineering resources throughout the academic year. The middle school mathematics and science teachers shared their teaching expertise and incorporated engineering in the curriculum where it made sense to do so. Data from this project will help strengthen a proposal to the National Science Foundation in the Graduate Students in K-12 education program.

Project funding from January 2010 – June 2010

Amount: \$14,609

Enhancing the DriveSafety Driving Simulator for Research on Short-Term Construction Work Zones

The goal of this project was to develop a set of software modules that interface with the DriveSafety simulator for research on short-term construction work zones. The software modules consist of two parts: (1) A set of tiles, stationary and moving entities that are not available in the DriveSafety simulation software (in particular, entities and dynamics regarding the applications of rumble strips), but are essential to creating scenarios for driving simulation in short-term construction work zones; (2) a software module that helps create scenarios based on the traffic data acquired from actual short-term work zones (in collaboration with Dr. Sridhar's sensor project). The custom tiles and entities developed in this project laid the foundation for carrying out driving simulation in short-term work zones. The incorporation of actual traffic data into simulator scenarios will undoubtedly increase the fidelity of the simulation results and is essential to capture the dynamics present in short-term work zones. The principle investigator for this project was Dr. Wenbing Zhao, a professor of Electrical and Software Engineering at CSU.

Project funding from February 15, 2010 – August 30, 2010

Amount: \$44,762





2010 Research Projects

Evaluation of Transverse Rumble Strips for Work Zones

Plastic Safety Systems has developed RoadQuake, a portable rumble strip, which is 11 feet in length, 12 inches wide and 0.8125 inches in height. The rumble strip has a profile twice the height of any rumble strip previously evaluated. The University Transportation Center and Dr. Deborah McAvoy, a Professor in the Department of Civil Engineering at Ohio University, propose to evaluate the effectiveness of Plastic Safety Systems' RoadQuake transverse rumble strips (TRS) with regard to delineation and safety. The objective of this study will be to assess the effectiveness of transverse rumble strips for work zone safety in reducing approach speeds of vehicles and alerting drivers of a pending unusual condition. In order to assess the effectiveness of the TRS, the array pattern utilized must be determined a priori. The following tasks will be performed to fulfill the study objectives: (1) conduct a simulator experiment through work zones utilizing various arrays of the TRS to determine the most effective array in terms of speed reduction and safety; (2) conduct a field experiment of driver behavior in paint work zones, with and without transverse rumble strips; and (3) conduct a questionnaire survey of drivers to assess their perception of the TRS.

Project funding from February 15, 2010 – February 14, 2011
Amount: \$99,067

Evaluation of Work Zone Safety Messages

Dr. Deborah McAvoy of Ohio University, working with the University Transportation Center at Cleveland State University, will evaluate the effectiveness of the Laborers 860 public information outreach campaigns related to work zone safety that are advertised on billboards throughout the Cleveland region during the construction season. Professor McAvoy will develop a questionnaire survey for distribution to Cleveland State students. It is expected that this project will continue on a multi-year basis and the population surveyed will be extended in the out years. A survey targeting the elderly population using digital video images capturing the billboards as they appear in the field will also be conducted. Data from both the digital survey and the questionnaire will be compiled and recommendations will be made to Laborers 860 regarding improvements in their billboard campaign.

Project funding from February 15, 2010 – February 14, 2011
Amount: \$43,044





**Plastic Safety
Systems, Inc.**



Constructor

For A Day

A record-setting 105 students and two teachers participated in the 24th annual Constructor for a Day program, which began at the Embassy Suites-Independence hotel on October 15. The day-long event, co-sponsored by the Ohio Contractors Association (OCA) and Construction Employers Association (CEA), kicked off with a tour of construction sites across Northeast Ohio. Nineteen students from Cleveland State University's Civil and Environmental Engineering program participated in the event, which gives students an opportunity to see job sites first-hand and network with heavy highway construction professionals.

The Transportation Center supports Constructor for a Day because the event encourages and facilitates links between the construction industry and students. In addition, the Center uses the event to help educate K-12 teachers from the region on various aspects of engineering and construction. This year, Education Coordinator Diane Burrowbridge attended the daylong event.

Program Chairwoman, Ann Nerone of Ballast Fence, welcomed students, members, and guests, and recognized supporting associations including the OCA and CEA, as well as the American Institute of Constructors (AIC), and the National Association of Women in Construction (NAWIC).

Bill Scanlon, physics teacher at Shaker Heights High School, was one of the teachers who accompanied university students to several sites that included a construction project located at the Garrett Morgan Water Treatment facility on Cleveland's near west side, a visit beneath the Inner Belt Bridge and a stop at the Fulton Road Bridge project above the Cleveland Metroparks Zoo. At the Fulton Road Bridge, participants met with the head engineer and the construction manager who described the demolition of the old bridge and the construction staging associated with the new bridge.

"I took this experience back to my classroom and was able to talk to my [high school] students about construction jobs and engineering as a career," said Mr. Scanlon. "This kind of direct contact with the engineering profession gives me more authority when describing future opportunities to my students."

After their field experience, participants returned to the Embassy Suites for professional networking and dinner. During the evening session, George Palko of The Great Lakes Construction Company, and chairman of the Transportation Center Advisory Board, presented OCA Cleveland Chapter scholarship awards to participants Chris D'Amico, Matt Winters, and Cody Schanfish. Matt Winters is a Civil Engineering student at Cleveland State University. Special presentations were made by Mark Laskey, Executive Director of Industry Services, CEA; Domenic Fatica, President, Northern Ohio Chapter, AIC; and Toni Walker, President of Cleveland Chapter of NAWIC. Mike Frank, CSP, CPAE, of Speakers Unlimited, was the night's featured speaker. He addressed the audience with a speech entitled "Little Ideas Pay Big Dividends."

DESIGN SQUAD

Taking the PBS show on the road to Cleveland

Our efforts to increase the number of transportation professionals are driven by the recognition that we can do more to encourage K-12 students to consider a career in Civil Engineering. To advance this goal, the Transportation Center staff and MC²STEM Cleveland Hub recently teamed with the popular PBS series “Design Squad” to host a two-day event at the Great Lakes Science Center (GLSC) in Cleveland. “Design Squad,” produced by WGBH in Boston promotes engineering and the product design process to middle school students in a reality show format.

Director of the MC²STEM Cleveland Hub, Sonya-Pryor Jones, Transportation Center Director, Dr. Stephen Duffy and Transportation Center Education Coordinator, Diane Burrowbridge participated in the interactive event Friday, November 21 and Saturday, November 22. Three CSU Civil Engineering undergraduates, Bill Fussner, Maria Hatzigeorgiou, and Lina Keidunaite volunteered their time to help make the event a success. Diane Burrowbridge and the student-volunteers aided local students, parents, and teachers in experiencing the hands-on design challenges depicted in the PBS television series.

The two-day “Design Squad” event kicked off on Friday, when 750 middle school students from Medina Christian

School, Westlake Burneson School, and a home-schooling network engaged in activities at four stations set up at various locations within the Great Lakes Science Center. The station topics included Watercraft Design, Paper Table Design, Pop-Fly, and Touchdown. At each station students received a brief explanation of the activity from volunteers before attacking the design challenge with materials provided. After a set time for construction and fabrication, students tested their designs against predetermined objectives. Both students and volunteers agreed that they had a great time with each activity. The students and their parents also had the opportunity to meet the show’s host, Nate Ball.

On Saturday, the Great Lakes Science Center opened the activity stations to the public. Locally, WVIZ/PBS, the SMART consortium, and the Westlake City Schools joined the CSU-UTC/MC²STEM partnership in supporting the program.

Westlake technology teachers Scott Kutz, Adam Purdy, and Judy McMasters led Westlake’s efforts, which included 30 students from Ms. McMasters’ class.

Natalie Hebshie, the Outreach Coordinator for

WGBH, sent the following message to the CSU-UTC/MC²STEM team after the event: “I want to thank you all for your hard work in putting together such awesome events on Friday and Saturday. The WGBH team, including Nate, had such a great time and we’re excited about all of the future opportunities for collaboration that have come up as a result of our work together.”

Diane Burrowbridge thoroughly enjoyed both days, saying “I worked the Watercraft activity and it was amazing to see how every design challenge was different – and how all participants managed to achieve the design challenge of holding five weights for at least 10 seconds before sinking. It was fun to watch them have a friendly competition amongst themselves to see which boat could hold the most weight, and often redesigning their boats to hold the maximum weight. Having the adults and parents get involved was so worthwhile.”



Second Annual Vex Robotics Competition

CSU hosted the second annual VEX Robotics Competition on Saturday, March 6, 2010. This year's competition featured twenty-eight teams and was an official qualifying event for the VEX Robotics World Championship Tournament in Dallas. A total of 145 students from fifteen schools participated in this year's event, up from 30 student participants last year. The event was organized and run by CSU Engineering students serving as volunteers, engineers from Northeast Ohio

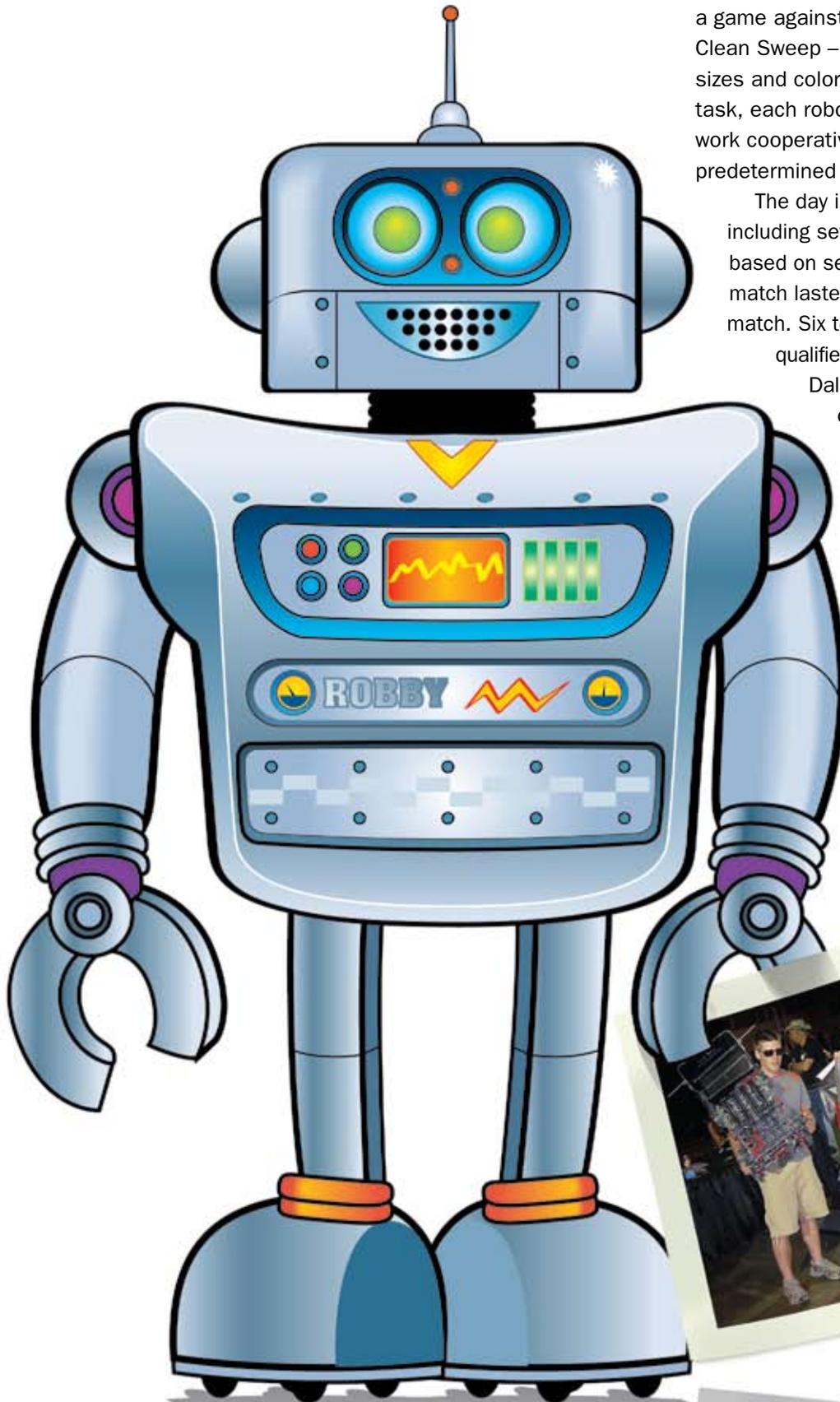
companies and CSU engineering faculty members serving as judges and referees.

The competition ran from 8:00 a.m. to 3:30 p.m. in the Cole Center on CSU's main campus. Cleveland State University's Transportation Center and the Fenn Academy offered support for the event.

VEX student competitors are required to build robots under specific design guidelines and restrictions before competing in a game against similar robots. The object of this year's game – Clean Sweep – involved moving balls of three different sizes and colors over a net to score points. To accomplish the task, each robot had to form an "alliance" with another and work cooperatively in addition to exercising its own predetermined strategy.

The day involved a series of matches between teams, including several rounds of qualifying in the morning and then, based on seeding, the playoff round in the afternoon. Each match lasted 140 seconds; four teams competed in each match. Six teams from among the 28 competing teams qualified to participate in the World Championship event in Dallas in April 2010. A total of 396 teams comprising over 2000 students from 16 countries participated in the World Championship event.

There is much interest in the community for this event, since it brings together such a variety of different science and math disciplines in a large engineering project. Next year's event is slated for March 5, 2011.



Cleveland's ACE Mentor Program

The ACE (Architecture, Construction and Engineering) Mentor Program is a nationwide program that began in 1994. The ACE Mentor Program of Cleveland includes dedicated professionals from NE Ohio's leading architectural, engineering and construction firms who act as mentors to high school juniors and seniors in an after-school program. These mentors introduced students to a variety of disciplines and career opportunities in the industry through a combination of lectures, tours and hands-on educational activities.

UTC Education Coordinator, Diane Burrowbridge served as a mentor with the Cleveland affiliate of the ACE Mentor Program from

January to May 2010, utilizing her civil engineering background. Students from John Hay High School and James F. Rhodes High School in Cleveland benefited from this year's program.

The 15-week program culminated with the final design project presentations, titled "A Cuyahoga Valley Museum of Transportation and Industry," at Windows on the River on May 11, 2010. ACE Mentor Program of Cleveland will expand next year to include another high school in Cleveland, and Diane Burrowbridge will continue to be actively involved in the program for the 2010-2011 school year.



UTC Awards Project Funding to Local K-12 Teachers

A lack of funding is often all that keeps innovative educators from teaching engineering and design principles in their classrooms. Hence the bulk of our nation's K-12 students miss out on the opportunity to participate in hands-on lessons within a design team learning framework.

To reverse this trend, the Transportation Center awarded funding to seven teachers and/or teaching teams who participated in last summer's Engineering Education Summer Conference.

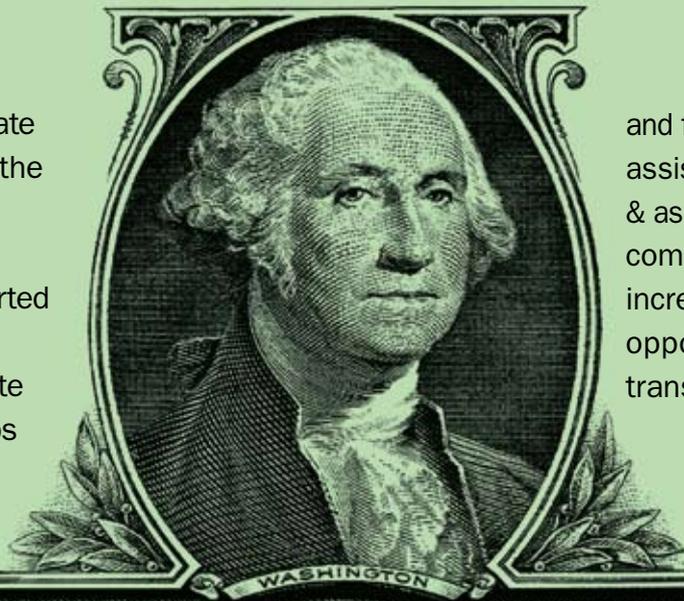
To win these project stipends, applicants had to submit projects that meet the requirements of a formal process. Requirements included a summary and explanation of how the project would enhance the ability to present pre-engineering material in K-12 classes, a list of materials and supplies with their approximate costs, and a schedule of execution for

the upcoming school year.

Winning entries came from the following K-12 teachers: Soraya Ahmad, Laurel School; Lindsey Gropitch, Marcus Garvey Academy; Scott Kutz, Westlake High School; Lisa Lauria and Marie Walsh, Regina High School; Bill Scanlon, Shaker Heights High School; Vic Stefan, Lake Schools (Stark County); and Lorraine Turner, Cleveland Heights/ University Heights Schools.

CSU's Dr. Nigamanth Sridhar, Dr. Debbie Jackson, Ms. Diane Tupa, and Dr. Wenbing Zhao evaluated and approved the funded projects. The results of each of these projects must be shared with the educational community in the form of presentations, which will be shared in future Transportation Center news releases.

Enrollment in the undergraduate Civil Engineering program for the 2009-2010 academic year remained steady and the Transportation Center supported 15 students with financial assistance. Ten undergraduate students received scholarships



and five graduate students received assistantships. Center scholarships & assistantships are provided on a competitive basis and are given to increase awareness of the career opportunities available within transportation engineering.

Support for Engineering Education

Undergraduate scholarships



Florence J. Nickerson is a freshman Civil Engineering major who is making the career change from professional truck driver.



Matt Winters is a junior Civil Engineering major and President of Engineers Without Borders student chapter.



Lina Keidunaite is a senior Civil Engineering major and Secretary of the CSU EWB chapter.



Wendy Rini is a freshman Civil Engineering major. She is a member of the Society of Women Engineers.



Maria Hatzigeorgiou is a junior Civil Engineering major. She is President of CSU's ASCE Student Chapter.



Jeremy Adato is a junior Civil Engineering major. He has worked as a UTC research assistant.



Minh Nguyen is a senior Civil Engineering major exclusively interested in environmental and structural topics.

Not pictured: Heather Duer, Marissa Jimenez, Jeff McComass.

Graduate assistantships



Troy Testerman is a graduate student in the Civil Engineering program.



Sriram Sanka is a graduate student in the Computer and Electrical Engineering program.



Michael Crifasi is a Master's student in English. He assists the Transportation Center with Communications.

Not pictured: Sharmila Kolipara, Karthik Thoutam

Undergraduate scholarships

Jeff McComass	\$9,466.00	UTC
Marissa Jimenez	\$2,899.00	UTC
Jeremy Adato	\$6,620.00	UTC
Wendy Rini	\$7,920.00	UTC
Florence Nickerson	\$7,920.00	UTC
Matt Winters	\$1,920.00	UTC
Lina Keidunaite	\$7,920.00	UTC
Maria Hatzigerogiou	\$4,000.00	UTC
Minh Nguyen	\$1,500.00	UTC
Heather Duer	\$4,217.00	UTC
\$ 54,278.50		



Jeremy Adato	\$1,300.00	John & Joan Bardou Scholarship
Marissa Jimenez	\$8,000.00	(app) HNTB Scholarship
Shaun Duffala	\$1,000.00	Eugene & Frances Klingshirn Scholarship
Ryan O'Hearn	\$1,200.00	William F. Bland
Matt Winters	\$2,000.00	William A. Patterson
Mike Luyster	\$8,000.00	Frank J. Ambrose
Daniel Kelbach	\$2,000.00	Parker Hannifin
Daniel Kelbach	\$2,000.00	Middough
Daniel Kelbach	\$1,500.00	Great Lakes
Brian Negrea	\$2,000.00	Scholarship for community college transfer
Jennie Zoldak	\$10,000.00	(app) University Honors Scholarship
Michael Ritossa	\$10,000.00	(app) University Honors Scholarship
Matt Winters	\$4,000.00	AACE Scholarship
Matt Winters	\$1,500.00	OCA Scholarship
\$ 54,500.00		

Graduate assistantships

Fall Semester 2009 graduate enrollment was up 38% year over year. Students receiving graduate assistantships and stipends throughout the academic year include the following:

Michael Crifasi	\$ 8,173.25
Troy Testerman	\$11,875.25
Sriram Sanka	\$20,038.75
Karthik Thoutam	\$ 844.15
Sharmila Kolipara	\$20,038.75
\$76,253.90	

Total support for graduate students in the Civil Engineering program this semester is **\$127,326.21**

Sources of Funds as of June 2010

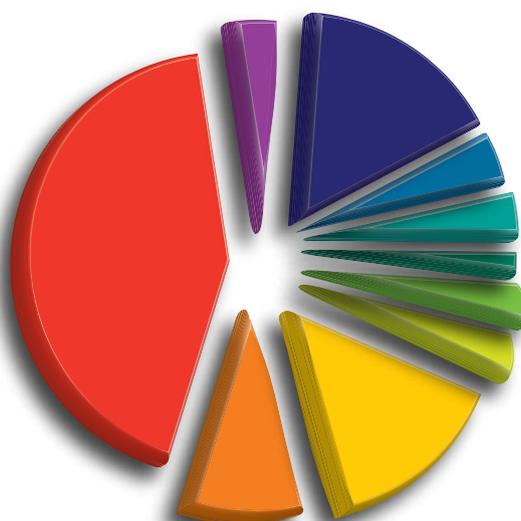


- 44%** US DOT
- 9.3%** Dept. Scholarships
- 3%** Donations
- 29%** CSU Cost Share
- 1.3%** CSU Capital Budget Overhead
- 15.4%** Laborers 860 MOU

US DOT	\$504,405.00
Scholarships	\$ 54,500.00
Donations	\$ 2,575.00
CSU Cost Share	\$171,866.38
CSU Capital Budget Overhead	\$ 7,838.00
Laborers 860 MOU	\$ 90,000.00

\$679,788.48

Expenditures as of June 2010



- 42.7%** Salaries & Wages
- 9.2%** Center Undergraduate Scholarships
- 14.5%** Graduate Assistantships
- 2.6%** Undergraduate Employment
- 2.9%** EESC
- 0.9%** Fringe Benefits
- 3.4%** Outside Research Contracts
- 4.4%** Other Expenses
- 15.7%** Indirect Costs
- 3.8%** Travel

Salaries & Wages	\$237,764.55
Center Undergraduate Scholarships	\$ 54,851.00
Graduate Assistantships	\$113,874.87
Undergraduate Employment	\$ 39,853.10
EESC	\$ 17,086.10
Fringe Benefits	\$ 45,075.56
Outside Research Contracts	\$ 20,625.00
Other Expenses	\$ 34,221.89
Indirect Costs	\$ 93,859.38
Travel	\$ 22,577.03

\$679,788.48

Research Funding Since UTC Inception

The CSU University Transportation Center has funded 10 transportation research projects since its inception, with federal and/or matching sources of funding. Four of the projects are considered basic research and six projects are categorized as applied research. A brief synopsis of the research projects is below:

National Science Foundation–MRI

Principal Investigator: N.L. Grugle, Cleveland State University
Project Name: Acquisition of Driving Simulator
Date: August 2006
Funding Source(s) & Amounts:
National Science Foundation: \$107,051
Cleveland State University: \$29,000
CSU UTC: \$11,000

Ohio Department of Transportation OPREP

Principal Investigator: N. L. Grugle, Cleveland State University
Project Name: Demonstration of Innovative Techniques for Highway Safety Data Analysis
Date: July 2006 – July 2009
Funding Source(s) & Amounts:
Ohio Department of Transportation: \$61,315
CSU UTC: \$128,006

CSU Faculty Research Development Program

Principal Investigator: N. L. Grugle, Cleveland State University
Project Name: Mandatory Speed Reductions in Work Zones—Implications for Driver Safety
Date: April 2007 – December 2008
Funding Source(s) & Amounts:
CSU: \$32,627

Garrett A. Morgan Technology and Education Program

Principal Investigator: S. F. Duffy, Cleveland State University
Project Name: Program for Women and Minorities in Transportation
Date: August 15, 2007 – July 31, 2008
Funding Source(s) & Amounts:
Shaker Heights School System: \$41,833

CSU Engaged Learning Research Program

Principal Investigator: N. Sridhar, Cleveland State University
Project Name: Sensor Network Systems for Measuring Traffic Behavior in Short-Term Work Zones
Date: July 1, 2008 – December 31, 2010
Funding Source(s) & Amounts:
CSU Engaged Learning Research Program: \$18,187

CSU University Transportation Center

Principal Investigator: N. Sridhar, Cleveland State University
Project Name: A Distributed Instrument for Measuring Traffic in Short-Term Work Zones
Date: July 1, 2008 – December 31, 2010
Funding Source(s) & Amounts:
CSU UTC: \$30,144

CSU University Transportation Center

Principal Investigator: D. Jackson, Cleveland State University
Project Name: Teachers and graduate students partnering to incorporate engineering in middle school mathematics and science classrooms
Date: January 1, 2010 – December 31, 2010
Funding Source(s) & Amounts:
CSU UTC: \$14,007

CSU University Transportation Center

Principal Investigator: W. Zhao, Cleveland State University
Project Name: Enhancing the DriveSafety Driving Simulator for Research on Short-Term Construction Work Zones
Date: July 1, 2009 – December 31, 2010
Funding Source(s) & Amounts:
CSU UTC: \$44,767

CSU University Transportation Center

Principal Investigator: D. McAvoy, Ohio University
Project Name: Evaluation of Transverse Rumble Strips for Work Zones
Date: January 1, 2010 – December 31, 2010
Funding Source(s) & Amounts:
CSU UTC: \$99,067

CSU University Transportation Center

Principal Investigator: D. McAvoy, Ohio University
Project Name: Evaluation of Work Zone Safety Messages
Date: January 1, 2010 – December 31, 2010
Funding Source(s) & Amounts:
CSU UTC: \$43,044

Total budgeted costs for the projects reported above is \$660,048.



UTC Research Publications and Performance

The Center has issued 16 reports as a result of the transportation research projects outlined in the previous section. In addition, eight research papers have been presented at academic/professional meetings that resulted from projects funded by the Transportation Center grant.



PEER-REVIEWED ARTICLES

“Sensor Network System for Measuring Traffic in Short-Term Construction Work Zones”

Manohar Bathula, Mehrdad Ramezanali, Ishu Pradhan, Nilesh Patel, Joe Gotschall, Nigamanth Sridhar. Proceedings of the 5th IEEE International Conference on Distributed Computing in Sensor Systems (DCOSS '09). June 8–10, 2009. Marina Del Rey, CA, USA. *To appear*

“Measuring Traffic in Short-Term Construction Work Zones”

(Poster paper) M. Bathula, M. Ramezanali, I. Pradhan, N. Patel, J. Gotschall, and N. Sridhar. Proceedings of the 8th ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN '09). April 13 – 16, 2009, San Francisco, USA.

EXTERNAL PROJECT REPORTS

OPREP Research Project: Demonstration of Innovative Techniques for Work Zone Safety Data Analysis



- Quarterly Report [2007-1]
- Quarterly Report [2007-2]
- Quarterly Report [2008-1]
- Quarterly Report [2008-2]
- Quarterly Report [2008-3]
- Quarterly Report [2008-4]
- Quarterly Report [2009-1]
- Quarterly Report [2009-2]

CONFERENCE PAPERS

“Using Driving Simulators for Highway Safety Research”

Grugle, N.L. Presentation given at the Ohio Transportation Engineering Conference, Columbus, OH 2006.

“Issues in Cellular Traffic Probe Data Evaluation”

Yang, Saini. Invited presentation in Ohio Transportation Engineering Conference, Columbus, Ohio, 2007.

“Integrating Engineering into High School Curricula”

J.E. Marencik, S.F. Duffy, D.E. Burrowbridge, and N. Sridhar. Proceedings of the 2009 Northeast American Society of Engineering Education Conference, April 3 - 4, 2009, Bridgeport CT, USA.

“Incorporating Engineering in Science Curriculum”

An Example Activity and a Wealth of Resources,” D.K. Jackson and D. Burrowbridge. Proceedings of Science Education Council of Ohio 2010 Conference, February 25-27, Columbus, OH. *To appear.*

“Widening the Pipeline: One Center’s Attempt to Influence Each Level”

D.K. Jackson, D. Burrowbridge, M. Arafah, S.F. Duffy, and N. Sridhar. Presented at the P-12 Engineering and Design Education Research Summit 2010, August 11-13, 2010, Seaside, Oregon.

“Engineering in K-12: Addressing the Need for Change in Ohio STEM Education”

M. Arafah, A. Trombetta, D.K. Jackson, S.F. Duffy, and D. Burrowbridge. Presented at the P-12 Engineering and Design Education Research Summit 2010, August 11-13, 2010, Seaside, Oregon.

Cumulative number of transportation seminars, symposia, distance learning classes, and K-12 outreach conducted by the UTC for transportation professionals.



4 Conferences

“Transportation System Security Conference”
S.F. Duffy (Chair),
29 October 2007, Cleveland, Ohio

Engineering Education Summer Conference (EESC)
D. Burrowbridge (Chair),
June 2008, Cleveland, Ohio

Engineering Education Summer Conference (EESC)
D. Burrowbridge (Chair),
June 2009 Cleveland, Ohio

Engineering Education Summer Conference (EESC)
D. Burrowbridge (Chair)
June 2010, Cleveland, Ohio

3 Short Courses

OCA Work Zone Supervisor Course
ATSSA Traffic Control Technician Course
OSHA Competent Person - Trenching
and Excavation Course

13 On-campus visits hosted for K-12 students and/or teachers by Center personnel

17 K-12 schools visited by Center personnel

2 Information tables at career fairs staffed by Center personnel

5 Science, engineering and technology fairs – Center staff serve as judges

2 Technology competitions hosted by the Center (*Vex Robotics*)

1 Technology competitions — Center staff serve as team advisors (*electric car*)

Cumulative number of transportation professionals and K-12 teachers participating in outreach activities.

28 Transportation professionals and students involved in conferences and short courses

86 K-12 teachers participating in outreach activities

1710 K-12 students participating in outreach activities

259 Parents interacting with Center personnel at outreach activities



Transportation Course Offerings at Cleveland State University

Listed below are catalog descriptions for the transportation-related courses that have been added since the beginning of the grant. The courses include three undergraduate courses and four graduate courses.

Undergraduate Courses

CVE 441 Traffic Flow Theory - The basic concepts and theories of traffic flow characteristics and the associated analytical techniques. This course reviews the foundations of traffic science and presents the major classes of models derived for traffic flow. Recent developments and topics of current research are introduced. The course also addresses the implications of the models and the traffic system properties for traffic operations and control.

CVE 442 Urban Transportation Planning - Focus on factors involved in the process of urban planning and regional transportation systems, encompassing all modes. Provides students with theory and applications of urban transportation planning studies, traffic models, investment models, programming and scheduling.

CVE 490 Construction Safety Engineering - A study in safety principles as they relate to construction sites and projects with a focus on heavy highway construction. Elements include accident record-keeping, reporting, requirements of the OSHA code; inspection for safety and hazards, risk control; and management issues related to these. Learn how to develop and implement a company safety program which includes identifying hazards as well as communicating safety policy to workers. Guest lecturers from industry will provide practical, hands-on experience.

Graduate Courses

IME 505 Human Factors Engineering - The physical and mental capabilities and limitations of the worker are studied and applied to the design and analysis of equipment, occupational tasks, and the environment. Topics include research methods, cognition, visual and auditory systems, controls, displays, anthropometry, and workplace design

CVE 541 Traffic Flow Theory - The basic concepts and theories of traffic flow characteristics and the associated analysis techniques. This course reviews the foundations of traffic science and presents the major classes of models derived for traffic flow. Recent developments and topics of current research are introduced. The course also addresses the implications of the models and the traffic system properties for traffic operations and control.

CVE 542 Urban Transportation Planning - Focus on factors involved in the process of urban planning and regional transportation systems, encompassing all modes. Provides students with theory and applications of urban transportation planning studies, traffic models, investment models, programming and scheduling.

CVE 593 Construction Safety Engineering - A study in safety principles as they relate to construction sites and projects with a focus on heavy highway construction. Elements include accident record keeping, reporting, requirements of the OSHA code; inspection for safety and hazards, risk control; and management issues related to these. Learn how to develop and implement a company safety program which includes identifying hazards as well as communicating safety policy to workers. Guest lecturers from industry will provide practical, hands-on experience.

Doctoral Dissertations

“Laboratory Evaluation of Fatigue Behavior of Thin Bonded Overlays on Roller-Compacted Concrete Pavements”

N. Amer, Doctoral Dissertation, Cleveland State University, May 2007.

Masters Theses

“Investigation and Evaluation of Portland Cement Pervious Concrete Using Nondestructive Testing and Laboratory Evaluation of Field Samples”

A. Mrkajic, Masters Thesis, Cleveland State University, May 2006.

“Field Performance of Portland Cement Pervious Concrete in Freeze-Thaw environments”

D. Miller, Masters Thesis, Cleveland State University, May 2006.

“Effects of Secondary Tasks on Driving Performance in Work Zones”

A. Gosh, Masters Thesis, Cleveland State University, May 2007.

“Reducing Concrete Cracking for Structures and Pavements”

J. Cleary, Masters Thesis, Cleveland State University, December 2007.

“A Sensor Network System for Monitoring Temporary Work Zones”

M. Bathula, Masters Thesis, Cleveland State University, December 2008.

“Broader Use of Steel Slag Aggregates in Concrete,”

J.P. Patel, Masters Thesis, Cleveland State University, December 2008.

Human Resources

Over the life of the grant, eight undergraduate students have participated on transportation research projects. In addition, 16 graduate students have participated in research projects. Moreover, 91 graduate students have enrolled in transportation-related advanced degree programs. To date, one doctoral candidate has obtained his degree with support from the Transportation Center.

Technology Transfer

The center has conducted one conference for transportation professionals which is described below: “Transportation System Security Conference,” S.F. Duffy (Chair), 29 October 2007, Cleveland, Ohio. Thirty-seven transportation professionals participated in this event.



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Tom Patton

24th Senate District of Ohio



July 2010

Dr. Stephen Duffy, Director
CSU University Transportation Center
114 Stilwell Hall
Cleveland, Ohio 44115

Dear Dr. Duffy:

As Chairman of the Ohio Senate Transportation Committee, I am committed to increasing the safety of the motorists and road construction workers whose lives intersect in highway construction work zones throughout our state each year.

As economic vitality returns to our great state, congestion on our highway systems will increase as companies move goods to market. Historically, commercial and personal vehicle travel miles increase faster than transportation capacity increases to accommodate demand. Our highway systems in Ohio are reaching middle age, which translates to more and more highway work zones. As the motoring public is increasingly exposed to work zones, safety is a major concern, both for drivers and construction workers.

I commend the Cleveland State University Transportation Center for its outstanding leadership in highway construction work zone safety research, educational outreach to the public, and its collaboration with industry members. The work of the Center to improve the safety of road work zones for all is, and will remain, a crucial ingredient in the successful expansion and maintenance of our state and nation's transportation infrastructure, a key component of our economic success.



I look forward to the Center's continued role in making Ohio's and the nation's highway construction work zones safe for all.

Respectfully,

A handwritten signature in black ink that reads "Thomas A. Patton".

Senator Tom Patton
24th Senate District of Ohio

