The advancement of Automated Vehicles (AV) and Connected Vehicles (CV) will change many aspects of transportation, including how we drive and how agencies plan and builds roads. AV include vehicles with varying levels of automation, from those features like adaptive cruise control, to fully autonomous vehicles requiring no driver intervention. CV, on the other hand, use forms of wireless communication, such as Dedicated Short-Range Communication (DSRC), to share information with other vehicles and roadside infrastructure, for example location, speed, roadway surface and weather conditions, signal timing and more. This sharing of information among vehicles and infrastructure, combined with automated driving features, will allow for safer, more efficient travel.

The Minnesota Department of Transportation (MnDOT) recognizes the importance of emerging technologies, such as AV and CV, and has begun developing a vision for these innovative technologies. MnDOT is working with the Department of Public Safety (DPS) to identify priority considerations for AV legislation and rulemaking, while also participating in various national groups researching and developing standards and guidelines for AV and CV. MnDOT has also been seeking stakeholder input from the public and private sectors over the last year and a half to identify priority areas for CV deployments in Minnesota.

(Continued on page 9)
EXECUTIVE COMMITTEE

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Please contact a representative from the Professional Development Committee if interested.

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MIDWESTERN ITE

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Midwestern ITE District NCITE Officer:
- Mike Bittner, KLJ 701.271.4879 mike.bittner@kljeng.com
Greetings, NCITE members!

For anyone considering a future run for the NCITE Executive Board who is worried about the commitment, as the outgoing 2016 President I can assure you that it goes by fast! Our elections and Annual Meeting are already upon us, and with a solid slate of candidates on the NCITE ballot this year, the organization will certainly be in good hands.

Much of the Board’s effort this year has been focused on important but mundane issues, such as stabilizing NCITE’s finances and updating our policies and procedures, but this has also been a very dynamic year. We kicked off the new year with our revamped NCITE website and online meeting registration, properly secured our tax exempt status, created our new Younger Member Committee, and secured the 2018 ITE Annual Meeting to be held here in the Twin Cities!

The new Younger Member Committee (YMC) will function similar to NCITE’s other standing committees and discussion groups, but will be focused on engaging members who are early in their careers through social and educational events held throughout the year, oriented around NCITE’s younger and incoming members. More information on the new committee, its structure, and its goals can be found at http://nc-ite.org/YOUNGER_MEMBER_COMMITTEE, where you can also sign up to receive committee updates.

In August, the ITE International Board of Directors finalized a decision that the 2018 ITE Annual Meeting will be held in Minneapolis, with John Crawford from Kimley-Horn serving as our local arrangements chair. ITE International will handle the technical program and registration, but it will be up to NCITE to provide the social events and local flavor as we welcome our transportation colleagues from around the world. A number of subcommittees are starting to be formed, and we welcome all available volunteers! Please contact John Crawford (john.crawford@kimley-horn.com) if you can help in these efforts to help create an inviting and memorable event in 2018.

I am very thankful for having had the opportunity to lead this terrific organization throughout 2016. Have a wonderful Thanksgiving and holiday season, and I hope to see many of you at NCITE events and committee meetings in the new year!

Joe Gustafson, PE, PTOE
2016 NCITE President
Young Member Committee Kick Off
November 10, 2016 — 4pm to 5pm
WhirlyBall Twin Cities—Maple Grove

&

2016 NCITE Annual Meeting
November 10, 2016 — 5pm to 10pm
WhirlyBall Twin Cities—Maple Grove

2017 Minnesota Transportation Conference
March 1-2, 2017
St Paul River Centre - St. Paul, MN

For professional development opportunities:
http://nc-ite.org/content.php?page=Professional_Development_Meetings

NCITE Calendar:
http://nc-ite.org/calendar.php
ITE NEWS

New Highway Capacity Manual

8 Part Webinar: ITE Learning Hub available here:

ITE COMMUNITY

SAVE THE DATE
ITE 2017 Annual Meeting & Exhibit
July 30–August 2, 2017—Toronto, Ontario, Canada

ITE LOL

Source: speedbump.com
The September Section Meeting was held on September 27th, 2016 at Hiway Credit Union and sponsored by Kimley Horn. The meeting topics included: general items, news on the addition of the Young Member Committee, the announcement of Minneapolis, Minnesota being selected as the host of the 2018 ITE International Annual Meeting, and a technical presentation.

The presenter was Denny Eyler, from SRF Consulting Group Inc, presenting on Getting More Life from Old Diamond Exchanges. Highlights of the presentation included:

- There are 76 diamond interchanges with 4 or fewer lanes, through the bridge, in the Twin Cities Metro Area. Outer metro area interchanges were built in the 1960's and 1970's, where suburban development has occurred.

- Some innovative interchange ideas include: roundabouts at ramp intersections, diverging diamond or double crossover diamond – DDI/DCD, diamond with added entrance loops or added inverted loops, lefts in advance and contraflow lefts, offset SPUI, 4 point diamond or ThrU-turn diamond, and unbalanced lanes.

- The I-494 at US 169 interchange used to be a diamond interchange. In the 1970’s, a four level directional interchange with some local access was the proposed solution to the growing traffic demands. Money was tight, so only the new central bridges were built around the year 1980 to fit the future directional. The bridges had width for 3 lanes plus shoulders in each direction. The bridges were then striped in the interim to provide 2 through lanes and double lefts and the interchange continued for awhile as a diamond. In the 1990’s the loops were added as the north-south roadway became US 169 which later finally became a freeway. Recently, the interchange was rebuilt to a partial directional along with 3-½ diamond interchanges for local access and 6 roundabouts for local ramp intersections.

- Some recommendations when evaluating improvements to a diamond interchange include: have a long range view of the needs and your options, understand existing and forecast traffic, use planning level volume / capacity calculations for alternatives comparison, develop a range of alternatives, make sure the preferred alternative meet the project goals, don’t build the wrong thing to standards, consider maintenance issues, and consider signing requirements.
The October Section Meeting was held on October 17th, 2016 at University of Minnesota Coffman Memorial Union, Mississippi Room and sponsored by Bolton & Menk. The meeting topics included: general items, news on the 2018 NCITE Elections, ITE District 4 Director John Davis announced the 2017 MWITE meeting will be in Madison, Wisconsin June 18-20, and presented student group ITSO with their plaque for winning the 2016 Traffic Bowl in June.

The presenter was Dr. Nichole Morris, from CTS, presenting on Computerized Crash Reports Usability and Design Investigation. Highlights of the presentation included:

- Nichole was hired by the State of Minnesota to overhaul the state’s crash report form MnCrash. Specifically, the project entailed the design and creation a crash report interface that improves accuracy, speed, reliability, and meaningfulness of crash report data utilizing Human Factors (HF) analyses and principles as well as capitalizing on the experience and expertise of law enforcement.

- Phase 1 consisted of assessing the existing crash report using HF principles to address human and system performance issues. This included Hierarchical Task Analysis, Cognitive Walkthrough Analyses, Interviews, Card Sorting Tasks, and Survey.

- Interviews consisted of samples from 12 officers from 7 different agencies with 1-20+ years of experience.

- Issues that impeding complete data on crash reports included court implications and reconstruction constraints. Officers are hesitant to include factors they cannot prove in court. However, defense attorneys use it all of the time! Officers are hesitant to contradict findings of a reconstruction report.

- Phase 2 consisted of Design & Usability Testing. This was to build a mock-up crash report based on the findings and recommendations of the HTA, card sorting, and cognitive walkthrough analysis. This was where focus was placed on the type of interface style, either wizard or full form.

- After extensive testing, users were split in preference between wizard and form-based interface. Therefore, both interfaces were recommended for use.

- MnCrash went live on January 1, 2016. Feedback has been positive so far.
ITE Midwest Student Leadership Summit

The first ITE Midwest Student Leadership Summit hosted by Iowa State University September 16th-18th, 2016 was a success with 82 students attending from 13 universities. Students from both the NDSU and University of Minnesota ITE Student Groups attended.

University of Minnesota ITSO Members Ellie Lee, Benjamin Nault-Mauer, and Kristin Carlson at the ITE Midwest Student Summit in Ames, Iowa.
Over the last year, MnDOT has been very proactive in seeking federal funds to help deploy CV technologies. MnDOT initially applied for funding under the USDOT CV Pilot Deployment Program. While the USDOT and FHWA expressed interest in MnDOT's proposal, the CV Pilot Program was not fully funded and just three pilot sites were selected, New York, Tampa Bay area, and Wyoming. MnDOT has also developed a proposal for a federal grant under the Fixing America's Surface Transportation (FAST) Act. The Advanced Transportation Congestion Management Technologies Deployment (ATCMTD) makes up to $60 million in funding available each year for transportation deployments utilizing advanced technologies to improve, safety, efficiency, system performance, and infrastructure return on investment. MnDOT is working with SRF Consulting Group to further refine its vision for CV deployments and will apply for federal funding from the ATCMTD program next year. In addition to seeking federal funds, MnDOT has made plans to move forward with deploying CV technology and has already begun research and testing of various CV related applications, such as:

- Testing vehicle-to-infrastructure (V2I) communications for intersection collision avoidance
- Using information gathered from the road weather stations for supporting snow plow operations and 511 traveler information
- Researching the use of vehicle-to-vehicle (V2V) communications for coordinating the movement of snow plows during “gang/tandem plowing” operations
- Testing V2I communications between maintenance vehicles and roadside DSRC units

As MnDOT looks to the future, feedback from stakeholder input revealed several areas of priority, with a strong focus on improving the safety and efficiency of snow/ice and maintenance operations. Every year, MnDOT experiences over 100 incidents involving maintenance vehicles in the Metro District, most of which are caused by other vehicles colliding with snow plows or roadside maintenance vehicles. MnDOT has tested and plans to further deploy a warning system which alerts drivers when they are approaching a maintenance vehicle, which may be on the shoulder or in the lane ahead. This could reduce the frequency and severity of crashes involving maintenance vehicles. In the short-term, these warnings would be provided via dynamic message signs (DMS) with future functionality including in-vehicle warnings.

In addition to safety concerns with maintenance vehicles, improving the operating efficiency is another high priority for MnDOT. Using CV technology to speed plowing operations could provide benefits. MnDOT is exploring signal priority for snow plows at traffic signals and ramp meters, similar to transit signal priority (TSP). Plows travelling on equipped corridors would request an early green or green extension from the next signal via DSRC. Priority requests at freeway ramp meters could either result in the meter flushing the queue or simply increasing the metering rate to allow the plow to enter the freeway more quickly.

As MnDOT develops and deploys CV technology, the amount and frequency of data being shared will increase exponentially. MnDOT has spent the last several decades deploying an extensive fiber optic network across the Twin Cities Metropolitan Area, which provides the agency with a robust communications backbone. As vehicles and roadside infrastructure share information through DSRC or other wireless technologies, much of this information will be passed back to MnDOT’s Regional Transportation Management Center (RTMC) for processing and archiving.
Applicable data will also be distributed by MnDOT to the public via a newly created, open-source application programming interface (API). MnDOT has had a history of making its data publicly available on its website. The API would provide a standardized, easily-accessible format for third-party developers to access the data and incorporate into applications.

Another CV initiative planned by MnDOT is the unification of several different electronic tolling/payment systems. With tens of thousands of paying users, the MnPASS Express Lanes use an electronic tag/transponder system to allow single-occupancy vehicles (SOVs) to pay for use of the lanes. Integrating this payment system with others, such as city parking ramps and regional tolling systems would provide convenience benefits to users and operational benefits to the agencies. MnDOT plans to initially partner with the City of Minneapolis to work on integrating the ABC Parking Ramps in downtown. Future work aims to integrate with parking at the Minneapolis-St. Paul International Airport (MSP), where frequent customers can now obtain a transponder allowing them to more quickly enter and exit airport parking.

Over the next year, MnDOT will continue to further refine its plans for deploying CV technology and begin some initial steps, including systems engineering, design, prototype development and pilot corridor deployment. The agency will continue to seek additional funding opportunities, while also securing internal resources to advance CV technology in Minnesota.
Geometric Design Technical Committee
Committee Chair: Kelly Besser - kbesser@stonebrookeengineering.com
Recent Agenda Items: Jim Rosenow's presentation of, "Don't Do What I Did!" a review of projects throughout his career. Roundtable discussion of what could have improved passed projects.
Future Agenda Items: TBD
Next Meeting: TBD for final meeting of the year.

Intersection Traffic Control Technical Committee
Committee Chair: Mark Wagner - mwagner@sehinc.com
Recent Agenda Items: Protected bikeways and signal phasing.
Future Agenda Items: Blue Line pedestrian crossing treatments.
Next Meeting: TBD

ITS Technical Committee
Committee Chair: Derek Nieveen - dnieveen@alliant-inc.com
Recent Agenda Items: Increased Safety Risks of In-Vehicle Signing, presented by Nichole Morris.
Future Agenda Items: New Design for the RICWS Sign, presented by Nichole Morris.
Next Meeting: December 2nd, 2016, 1:00pm to 3:00pm, MnDOT Waters Edge Conference Room A.

Pedestrian and Traffic Safety Technical Committee
Committee Chair: Natalie Lindsoe - natalie.lindsoe@hdrinc.com
Recent Agenda Items: MnDOT Pedestrian and Bike Counting Project presented by Greg Lindsey.
Future Agenda Items: Experiences with processing public requests.
Next Meeting: December meeting date TBD. See Committee page for updates.

Planning Methods and Applications Technical Committee
Committee Chair: Steve Wilson - swilson@srfconsulting.com
Recent Agendas Items: Have not met since Fall 2015 INCITER.
Future Agendas Items: TBD
Next Meeting: TBD (meetings are typically help on the last Wednesday of every other month)

Traffic Operation and Maintenance Discussion Group
Committee Chair: Adam Bruening - adam.bruening@co.washington.mn.us
Recent Agenda Items: Equipment and Bucket Trucks, what works for agencies?
Future Agenda Items: Sign Design Programs, what are agencies using?
Next Meeting: TBD (meetings are typically held on the first Wednesday of each month 11:30am—1pm)

Simulation and Capacity Analysis Technical Committee
Committee Chair: Ben Hao - ben.hao@aecom.com
Recent Agenda Items: 2016 HCS Update presented by Jim McCarthy. Multimodal 3D Visualization for the Snelling/Midway Soccer Stadium presented by Joe DeVore
Future Agenda Items: Comparisons of Mesoscopic Traffic Simulation Programs presented by Derek Lehrke.
Next Meeting: November 15th, 2016, 1:00pm to 3:00pm, MnDOT Waters Edge.
Trip generation data is central to traffic engineering. Having relevant, current trip generation data is key to developing meaningful forecasts in our traffic studies. For decades the Institute of Transportation Engineers’ (ITE) Trip Generation Manual (henceforth called the Manual) has been the go to source for trip generation data. But should it be the sole data source that engineers rely on for trip generation data?

The Manual suggests that, “the user may wish to modify trip generation rates presented in this document to reflect … special characteristics of the site or surrounding area.”

At Spack Consulting, we use the Manual as a starting point for our studies, but we have frequently found that the Manual has gaps in the areas of: regional differences, land use limitations, and dated data. That’s why we’ve chosen to collect more than 5,000 hours of local trip generation data over the last two years to use in our own studies.

As any reader of my blog, MikeOnTraffic knows, we like to share and freely distribute our data at TripGeneration.org. Following are some interesting findings from our dataset.

**Regional Differences**

Oftentimes, the data presented in the Manual doesn’t present a complete enough picture to identify accurate traffic patterns. We worked with the Florida Department of Transportation to compare gas station trip generation per fueling position in Florida, and Minnesota and compare it to ITE’s numbers. When comparing rates for the gas station, ITE underestimates both Florida and Minnesota data. Minnesota is at least 24 percent higher across the board. Imagine missing one out of every four cars in your study and you can easily see how major impacts could be missed.

<table>
<thead>
<tr>
<th>Time Frame</th>
<th>Minnesota Trips per Unit</th>
<th>Florida Trips per Unit</th>
<th>ITE* Trips per Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>227.87</td>
<td>194.92</td>
<td>152.84</td>
</tr>
<tr>
<td>AM Peak Hour of the Generator</td>
<td>17.03</td>
<td>13.75</td>
<td>13.32</td>
</tr>
<tr>
<td>AM Peak Hour of Adjacent Street (7-9 am)</td>
<td>15.05</td>
<td>12.53</td>
<td>11.84</td>
</tr>
<tr>
<td>PM Peak Hour of the Generator</td>
<td>18.53</td>
<td>15.69</td>
<td>14.52</td>
</tr>
<tr>
<td>PM Peak Hour of Adjacent Street (4-6pm)</td>
<td>18.19</td>
<td>14.87</td>
<td>13.86</td>
</tr>
</tbody>
</table>


**New Land Uses**

Another piece of trip generation data that we focus on is continually adding new land uses. While having data that is relevant to your location is important, having data for the specific type of land use you are studying is equally important. It ensures that any studies, reports, or projects you are conducting will be accurate.
A lot of new land uses have become popular since ITE’s last *Manual* was published in 2012, including microbreweries / distilleries, standalone emergency room facilities, and marijuana dispensaries, all of which do not have land uses listed in the manual.

Recreational marijuana dispensaries have sprung up in four states, and the District of Columbia, and many more states are considering adding them. How do engineers plan for the traffic needs of these dispensaries? It’s tricky if you’re using the *Manual*. The most similar land uses in the *Manual* to a marijuana dispensary are, pharmacy without a drive through (ITE 880), pharmacy with a drive through (ITE 881) and specialty retail stores (ITE 826). To see how close, the data in the manual compares to these land uses, we partnered with Ridgeview Engineering Consultants to collect traffic data from four dispensaries in the Denver Colorado area. The results? The marijuana dispensaries are generating about 10x more traffic than a typical retail store per square foot and 5x more than a pharmacy.

### Rate - Trips Per KSF

<table>
<thead>
<tr>
<th>Weekday</th>
<th>Marijuana Dispensary</th>
<th>ITE 880: Pharmacy w/o Drive Thru</th>
<th>ITE 881: Pharmacy w/ Drive Thru</th>
<th>ITE 826: Specialty Retail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>402.27</td>
<td>90.06</td>
<td>96.91</td>
<td>44.32</td>
</tr>
<tr>
<td>AM Generator</td>
<td>37.31</td>
<td>7.71</td>
<td>8.36</td>
<td>6.84</td>
</tr>
<tr>
<td>AM Adjacent Street (7-9am)</td>
<td>16.86</td>
<td>2.94</td>
<td>3.45</td>
<td>n/a</td>
</tr>
<tr>
<td>PM Generator</td>
<td>63.61</td>
<td>11.07</td>
<td>9.72</td>
<td>5.02</td>
</tr>
<tr>
<td>PM Adjacent Street (4-6pm)</td>
<td>54.64</td>
<td>8.40</td>
<td>9.91</td>
<td>2.71</td>
</tr>
</tbody>
</table>

1 From the Institute of Transportation Engineers' *Trip Generation Manual, 9th Edition*.

### Saturday

<table>
<thead>
<tr>
<th>Rate - Trips Per KSF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marijuana Dispensary</td>
</tr>
<tr>
<td>Daily</td>
</tr>
<tr>
<td>Peak Generator</td>
</tr>
<tr>
<td>AM Adjacent Street (7-9am)</td>
</tr>
<tr>
<td>PM Adjacent Street (4-6pm)</td>
</tr>
</tbody>
</table>

1 From the Institute of Transportation Engineers’ *Trip Generation Manual, 9th Edition*.

### Dated Data

Finally, time is the enemy of data. The last release of the *Manual* was published in 2012. That alone makes even its most current data questionable. But with a little digging, you’ll find datasets, such as the one for automobile dealerships, that have data points going all of the way back to the 1960’s. To make accurate forecasts as our industry is rapidly changing (autonomous vehicles, shared vehicles, etc.), our industry needs current data. ITE has convened a committee to address these concerns with trip generation data. Until ITE’s trip generation data system is modernized, we’ll continue to collect current, local data that we freely share at tripgeneration.org. Please consider supplementing ITE’s data with ours in your studies as well as sharing any current trip generation data you have.
For several years, the Minnesota Legislature has been exploring the potential of increasing speed limits on rural highways that currently have 55 mph speed limits. Currently, state law sets statutory speed limits on all public roads.

As recently as 2013, legislation has been introduced that would have changed the statutory speed limit in statute 169.14, Subd. 2(3) from 55 mph to 60 mph. This would have applied to all roads, including county roads, city streets, township roads, and any other roads that don’t fall into one of the other categories in statute 169.14 and don’t have a different speed limit that was set as a result of a traffic engineering study. Ironically, the trunk highway system, which has been the primary focus of legislative interest, is entirely comprised of sections that have speed limits authorized as a result of engineering studies and therefore would not be directly affected.

Fortunately, MnDOT and local representatives have been able to make the case that a blanket increase in speed limit would not be safe. In 2013, after performing engineering studies, MnDOT increased the speed limits from 55 to 60 mph on 700+ miles of rural trunk highways, primarily in western Minnesota.

In 2014, Regular Session Laws, Chapter 312, Article 11, Section 36 was enacted, which required MnDOT to perform engineering and traffic investigations on trunk highways that are two-lane, two-way roadways with a speed limit of 55 miles per hour. Speed limits are expected to be increased on roadway segments where studies find that the speed limit can be reasonably and safely increased. The statewide review must be completed by 2019. Stonebrooke Engineering was selected to assist MnDOT in performing studies on more than 5,000 miles of trunk highway.

(Continued on page 15)
Spot speed studies will be performed on over 350 study segments. Spot speed studies measure point travel speeds of a representative sample of vehicles in the population. Speed studies will be performed using either pneumatic tubes or radar units, depending on roadway ADT. Field investigations are also needed, to provide a general snapshot of the environment of the study segment to the MnDOT District Traffic Engineer.

Stonebrooke’s role is to perform speed studies and field investigations, analyze speed and crash data, and provide reports to MnDOT. Analysis of crash data includes calculating overall crash rates and Fatal + “A” severity crash rates for the study segment and comparing to average and critical crash rates. If a segment’s crash rate exceeds the critical rate, it is not a good candidate for an increased speed limit without other improvements.

When all data collection, investigations, and analysis is complete, Stonebrooke assembles a report for each segment. The reports are organized such that the front page provides an at-a-glance look at crash rates, sample results, and field investigations. This page provides the MnDOT district traffic engineer with a good indication of whether this corridor is a good candidate for a 60 mph speed limit. The second page provides a more detailed description of the study, and subsequent pages provide pictures and additional information.

When executed properly, rural trunk highway speed limit increases from 55 mph to 60 mph provide more efficient travel without compromising safety. The structure of study components allows for these speed increases to be made in an informed, accurate, and responsible manner. As legislative interest in speed limits continues, this type of study provides the necessary documentation to provide speed limit increases that are based on usable data and documented safety measures. And as with any speed limit change, drivers will need to continue to practice safe driving techniques and situational awareness.
Rumble strips, which are grooves or rows of indents installed in roadway pavement, are designed to alert inattentive drivers through noise and vibration and reduce the number of serious crashes. While rumble strips are effective in reducing crashes, some landowners near rumble strip installations have complained about the unwanted noise caused by vehicles that drift over the edge or centerline of the roadway.

To reduce this unwanted exterior noise, alternate rumble strip designs have been created and tested. One such design is the sinusoidal rumble strip. As the name implies, this design uses a sinusoidal wave shaped rumble strip to create the noise and vibration necessary to alert the driver. With a less abrupt design than the standard MnDOT rumble strip, the exterior noise level is reduced.

In a recent study completed by Wenck, David Braslau Associates, and MnDOT, sound levels were monitored for four types of centerline sinusoidal rumble strips installed along Trunk Highway (TH) 18 in Mille Lacs and Aitken counties in Minnesota. All four of the centerline rumble strips evaluated were a 14 inch wavelength sinusoidal design but with different geometric configurations. A single strip 14 inches wide and a double strip of two 8 inch wide strips spaced 4 inches apart were tested, each with two different depths – 3/8 inch and 1/2 inch.

An evaluation of motorcycles and bicycles was carried out at the MnROAD facility near Albertville, Minnesota, to determine how various rumble strip configurations affected rider performance. An overall summary of the survey data indicates a preference for rumble strip designs which were 14 inches wide with a maximum depth of 3/8 inch. Designs with two strips spaced 4 inches apart were the least desirable, according to the motorcyclist evaluations due to the raised section located between the two rumble strips.
Tests on TH 18 were performed with three different vehicles – passenger car, pickup truck and a class 35 tandem dump truck. A single speed of 60 mph was used, as this was shown to provide the most meaningful data from previous studies. For each of the designs, an initial test was performed with vehicles traveling on normal pavement, followed by three passes on the rumble strip.

One-third octave band sound levels were taken 50 feet and 75 feet from the edge of the roadway, as well as inside the vehicle adjacent to the driver. Video recordings were taken 50 feet from the edge of the roadway. Digital audio recordings were captured for each of the sound level readings. The maximum observed pass-by level was used for the comparative analysis.

Observed interior and exterior sound levels were generally similar to previous sinusoidal rumble strips tested, but there were measurable variations between the four different designs. The shallower strips increased the interior sound level, not greatly different from the deeper strips, but generated slightly lower sound levels measured 50 and 75 feet from the highway centerline.

The 14 inches wide, 1/16 – 1/2 inch depth design was recommended for further implementation by MnDOT. While all the sinusoidal designs provided adequate driver feedback and minimal exterior noise for passenger cars, this design also gave good results for pickup trucks. This is important because pickup trucks make up a significant portion of the vehicle fleet. The single 14 inch wide strip was also more desirable for motorcycle riders compared to the double 8 inch strips.
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TKDA
800.247.1714 tkda.com

10435 Argonne Woods Drive, Woodridge, IL 60517
603.543-1300
New Members

Doug Arnold – Kimley Horn
Michael Fairbanks – MnDOT
Lindsay Gaines – TKDA

Moves

Beverly Farraher – City of Saint Paul, formerly with MnDOT
Sean Kelly – KLJ, formerly with NDSU
Daniel McCormick – Carver County, formerly with MC Engineering

In Remembrance

Jack Webster Anderson (Traffic Engineer, NCITE Member), passed away on July 11th, 2016 at the age of 90. Survived by his wife of 67 years Joyce Anderson; sons Chuck (Donna) & Robb (Julie) Anderson; and daughter Lisa Anderson. Born and raised in St Paul, Minnesota Jack served in the US Navy before attending undergraduate studies at the University of Minnesota and finishing his degree at the University of San Francisco. He earned his Masters of Traffic Engineering from Yale University. Jack's lifelong profession was traffic engineer.

Jack was a passionate and one time scratch golfer, winning many tournaments. As a gifted natural musician, he most enjoyed playing piano and organ, frequently drawing a crowd as he played. Among Jack's other interests were flying and sailing.

Jack was a lifelong member of NCITE and his contributions to NCITE and the INCITER can be seen in the Newsletter archives—his first INCITER article was published in Volume 2 Issue 1 in March of 1967. He was active in NCITE holding lead positions on multiple committees over the years including NCITE President in 1971, and Midwestern ITE District Director in 1985.

We extend our deepest sympathy to Jack’s family – he will be missed.

If you or a friend has changed jobs or moved, we would like to stay in touch. Members, please update your information by visiting http://www.ite.org/membership/index.asp. To access this area, you will need to know your membership number. Your “username” is your membership number, and your “password” is the first 6 letters of your last name (e.g. Johnson=Johnso). Non-members please contact Nicklaus Ollrich via phone (612.373.5350) or email (nicklaus.ollrich@metrotransit.org) for assistance. Please provide you name, title, employer, complete street address (including mailstop, if applicable), telephone number, fax number, and email address.