MASS

Interchange

Sharing the Best in Transportation Technology

Spring 2014
Volume 28
Number 1

Inside

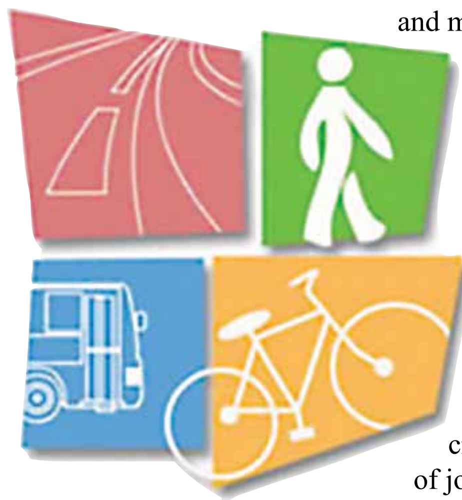
massDOT
Massachusetts Department of Transportation

U.S. Department of Transportation
Federal Highway Administration

UMass Amherst Transportation Center

Baystate Roads Program
mass.gov/baystateroads

MassDOT welcomes feedback on recent Capital Investment Plan, weMove Mass public meetings



MassDOT recently concluded six public meetings held throughout the Commonwealth to discuss the two transportation planning documents that were released for public review: a Long-Range Transportation Plan, ***"weMove Massachusetts (WMM): Planning for Performance,"*** and the first draft of its five-year ***Capital Investment Plan (CIP) for FY2014-FY2018***.

The $12.4 billion CIP program makes long-term investments that will create growth and opportunity for residents across the Commonwealth and represents the first unified, multi-modal capital investment plan covering all MassDOT highway and municipal projects, regional airports, rail, and transit, including the MBTA and Regional Transit Authorities. The plan makes investments across the entire state, is flexible, and spends wisely while creating thousands of jobs over the next several years.

"The five-year plan will invest in projects identified in *The Way Forward* and confirmed by the outreach MassDOT conducted on the weMove Massachusetts project," said MassDOT Secretary and CEO Richard A. Davey. "WMM continues MassDOT's

> "WMM continues MassDOT's commitment to improve performance for every mode of travel. It is based on national performance data, MassDOT policies, and robust civic engagement."
>
> — *MassDOT Secretary and CEO Richard A. Davey*

Please see MASSDOT on page 12

Study shows how truck speed and distribution method influence salt bounce and scatter

Photo by Mike Smith

Shaughn Kern, Technical Writer; and Alexander Slepak, Technical writing intern Center for Technology & Training. Article from the Michigan LTAP/Bridge Newsletter 27.3

Thousands of years ago, salt was prized for its ability to preserve food; it was also sown into the soil of enemy lands by invading armies to make the soil unsuitable for agriculture. Whether our ancestors understood the science of soil salinity is debatable, but they did have one thing in common with today's winter maintenance professionals: they knew the value of salt as a resource, and they appreciated the environmental damage salt could cause if misused.

According to a study conducted by the Michigan Department of Transportation (MDOT) in the early 1970s, 30 percent of dry salt used on roads is lost immediately to bounce and scatter. The study concluded that pre-wetting the salt before spreading it reduced bounce and scatter by improving the application pattern and accelerating the melt-rate. Today pre-wetting has become common practice and is recognized by state and local transportation agencies as a significant cost-saving measure. However, further research was necessary to determine the influence of other distribution variables on the effectiveness of salt.

Building on Past Experience

In the summer of 2012, the MDOT Operations Field Services Division built on the research from the 1970s, with the goal of determining an optimum vehicle speed and distribution method for applying salt. MDOT's Operations Field Services Division provides training and support for maintenance garages that are responsible for summer and winter maintenance on state trunk lines in Michigan.

The new study re-examined the effectiveness of salt treated with a liquid chloride solution, and correlated it to truck speed and salt distribution systems. The comparison of two salt types (untreated and treated), three truck speeds (25, 35, and 45 mph) and two distribution systems (Y-chute and cross-conveyor*) made for a total of twelve tests. To conduct the tests, MDOT staff laid out a grid on a 100-foot stretch of unused freeway in Southwest Michigan. This location made for an ideal test site where traffic would not disturb the salt or create a dangerous situation for the staff conducting the tests.

The test grid was made up of 12 four-foot lanes, which simulated a two-lane road with 12-foot paved shoulders (see diagram below). Trucks driving in the left travel lane dropped salt into the "target area," which spanned four feet on each side of the centerline. The amount of salt recovered from the target area and each four-foot grid lane was tabulated as a percentage of the total amount of salt that was dropped. Results were presented in a graphic form, as shown on page 3.

Special attention was paid to salt recovered in the target zone and the rest of the travel lane, since only salt in the travel lane is considered effective. Over the course of the entire study, salt recovered in the travel lane ranged from 95.3 percent to 35.7 percent, depending on the speed of the truck, the distribution system used, and whether the salt was treated or untreated. As expected, the results of treated vs. untreated salt verified those found 40 years ago: treated salt performed significantly better at all speeds and through all distribution systems. The comparison between cross-conveyor and y-chute systems resulted

in slightly better performance for the conveyor type. For untreated salt, nine percent more stayed in the travel lane when distributed through a conveyor; with treated salt, 13 percent more stayed in the travel lane.

Speed Increases Bounce and Scatter

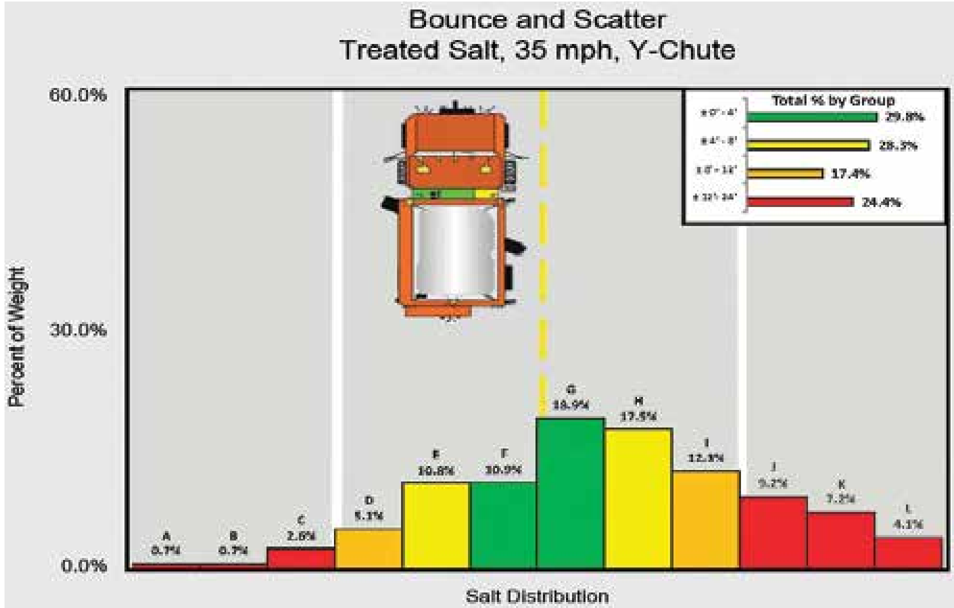
Regardless of salt type or delivery system, truck speed had the most profound effect on how much salt was lost to bounce and scatter. The most effective method of spreading salt on roads, a truck driving at 25 mph spreading treated salt with a conveyor, lost only nine percent to bounce and scatter. The same test at 35 mph resulted in 32 percent loss, with 45 mph showing a 45 percent loss. The table below shows the projected cost associated with the salt loss at each speed, based on the seasonal cost of salt in MDOT's Southwest region of Michigan.

Speed	Percent Wasted	Projected Cost
25 mph	9 %	$ 355,080
35 mph	32 %	$1,247,400
45 mph	45 %	$ 1,762,200

The main recommendation from this study, the complete results of which are available in a project summary report that MDOT published in November 2012, is crystal clear. According to the report, "The most effective scenario … occurs when a treated salt product is applied with a cross conveyor from a truck traveling at 25 mph. Conversely, salt bounce and scatter is at its highest when applied from a Y-chute delivery system in a truck traveling at 45 mph."

Less Salt is Better

Reduction of salt waste has benefits beyond cost savings. Salt causes deterioration of the road, corrosion of the vehicles travelling on it, and it can negatively affect roadside vegetation. Further, effective salt use can limit the need for abrasives such as cinders and sand, for which cleanup costs can be significant.



The report called for further testing using other delivery systems such as zero velocity spreaders (which eject salt in a way that compensates for truck speed), salt slurry generators, and a variety of y-chute heights. This past summer, MDOT ran a second phase of testing to cover these additional variables.

Phase 2: Dialing it in

In the second phase of testing, which was conducted during the summer of 2013 at the same site as the first phase, MDOT Roadway Operations Engineer Justin Droste established a simplified method of quantifying results. "Instead of reporting results in graphical form organized by grid lane, we combined all grid lane values into a single point value for each test," Droste explained. "The single point value provided a simple overall assessment, which enabled us to compare test results more easily."

Results indicated that the most effective methodology was to spread salt from a zero-velocity system at 25 mph, with an effectiveness score of 0.93 on a scale of 0.00 to 1.00. Even at 35 mph, the zero-velocity system had an effectiveness score of 0.82, which was better than all other systems running at 25 mph. Notably, when accelerated to 45 mph, the effectiveness of the zero-velocity system dropped to two-thirds of the score at 25 mph.

In Conclusion

Based on results from the two phases of the study, MDOT released a Maintenance Advisory to update statewide deicing practices. The advisory specifies a maximum speed of 25 mph while applying deicing material. Justified exceptions to the practice include: peak hours on high-speed routes; using zero-velocity spreaders, slurry generators, or other technology that limits salt scatter; or other circumstances approved by the region engineer. The advisory also recommends 7 to 10 gallons of liquid per ton of dry salt.

Tim Croze, region support engineer of the MDOT Operations Field Services Division, is pleased with what his team learned from the study. "It's nice to assign actual effectiveness numbers to the many different options we have for spreading salt," he said. "The right combination of salt type, distribution system, and truck speed will enable us to minimize salt waste by keeping more of it in the travel lane."

Bounce and Scatter Summary Report
www.MichiganLTAPorg/DeicingStudy

MDOT MaintenanceAdvisory
www.MichiganLTAP.org/MA2013-01.

Diagrams courtesy of Michigan Department. of Transportation.

** Cross Conveyor is a conveyor system that mounts underneath a dump body's tailgate. Y-Chute is a rear distribution system with a center-drop spinner.*

Plow more and salt less by using multi-sectional plow blades

By Mike Smith
Contributing Writer

Photos by Mike Smith

Have you considered using a multi-sectional plow blade vs. the same old steel we have all pushed for years? At the beginning of the 2013-14 winter season, I outfitted one of my plows with a multi-sectional carbide blade encased in rubber. This blade comes in 3 foot and 4 foot sections to accommodate any length plow. Rather than standard plow bolts the blade is held in place with bolts that pass through a bushing allowing each section to articulate up and down 1.5 inches. They also bend backwards 1.5 inches. This feature allows each section to reach down into a wheel rut and remove more snow than a common steel blade. You might not think 1.5 inches would make much of a difference, but it makes a huge difference in the melting of remaining snow.

This photo shows a street plowed with the multi-sectional carbide blade on the left and a traditional steel blade on the right.

The next big advantage is the longevity of the blade. Being comprised of carbide steel and rubber, this blade is projected to last for multiple seasons. We have 1196 miles on this blade and have not noticed any visible wear yet. For the same amount of mileage with steel, we would have used 4 standard blades. Each standard blade's cost is around $200. When you figure in the 2 people needed to change it at 2 hours each for an additional $68 and about $20 in bolts, the cost for one steel blade is closer to $300.

Now if you consider the chances for an injury to a worker during a blade installation each blade change has the potential to be even more expensive. As a supervisor, I always consider the possibility of injury to the employees.

Ultimately, my goal is to find the best way to remove snow and ice from the roadway in the most efficient way possible. The use of multi-sectional plow blades has increased our effectiveness and reduced our overall cost by saving man hours, saving money, and saving the environment by using less salt on the roadways.

Mike Smith is the Highway Superintendent for the Town of Heath as well as an instructor for the Baystate Roads Program.

"Succeeding as a Foreman V: Turning theory into action"

The Baystate Roads Program is pleased to announce that a new workshop, "Succeeding as a Foreman V", will be held in March. This session will serve as the final installment in the popular "Succeeding as a Foreman" series that began in 2012.

Foreman V will introduce you to specific methods of responding to the many challenging issues raised in the first four sessions. It will also provide helpful tips on how to communicate effectively in difficult interactions. You will devise your own Personal Action Plan for turning problems into solutions.

If you have attended any of the previous four sessions in this series, now is your chance to tie it all together and get any final questions answered. But, if you are new to the series, you are also welcome to attend "Foreman V". Either way, you will benefit from the discussions on how you do have the power to make needed changes on the job.

#66-MASSACHUSETTS SPEED LAWS

Speed limits & speed limit setting

Background

The National Highway Traffic Safety Administration (NHTSA) defines speeding as "travelling in excess of the posted speed limit" or "driving too fast for conditions." Nationally, speed-related crashes account for 30 percent of all fatal crashes, resulting in over 10,000 fatalities annually and a societal cost exceeding $40 billion. The numbers in Massachusetts are similar where 30 percent of the 349 fatalities in 2012 were speed-related. In Massachusetts, 56 percent of speed-related fatalities occurred on roadways with a posted speed limit of 35 mph or less, and 78 percent of speed-related fatalities occurred on a roadway with a posted speed limit of 45 mph or less. From an engineering standpoint properly posted speed limits represent the front lines of speed management. This Tech Note provides basic information regarding speed limits and guidance on proper speed limit setting and sign posting.

Speed Laws in Massachusetts

Within the Massachusetts General Laws (MGL) there are two sections that deal specifically with speed limits.

MGL Chapter 90, Section 18 allows for the posting of numerical limits on the typical speed limit sign. This law also indicates that the limit must be based on engineering study and needs approval via a Special Speed Regulation approved by the Registry of Motor Vehicles (RMV) and MassDOT. Please note that all regulatory speed limit signs not posted under this procedure are in violation of the law and are not legally enforceable.*

MGL Chapter 90, Section 17 applies to unposted roadways and specifically states that it shall be prima facie evidence of a rate of speed greater than is reasonable and proper as aforesaid (1) if a motor vehicle is operated on a divided highway outside a thickly settled or business district at a rate of speed exceeding fifty miles per hour for a distance of a quarter of a mile, or (2) on any other way outside a thickly settled or business district at a rate of speed exceeding forty miles per hour for a distance of a quarter of a mile, or (3) inside a thickly settled or business district at a rate of speed exceeding thirty miles per hour for a distance of one-eighth of a mile, or (4) within a school zone which may be established by a city or town as provided in section two of chapter eighty-five at a rate of speed exceeding twenty miles per hour.

**Please note there are special speed law provisions in the MGL for the Massachusetts Turnpike and Department of Conservation and Recreation (DCR) [formerly the Metropolitan District Commission (MDC)] Roads.*

Setting Speed Limits

Municipalities should contact MassDOT to request speed limit posting on state-owned roadways. **It is the responsibility of the municipality to follow the procedures for locally-owned roadways, which require approval by both MassDOT and the RMV. When considering the establishment of speed limits it is imperative that you review the following two sources which will provide specific guidance on speed zoning: (1) Procedures for Speed Zoning on State and Municipal Roads, and (2) The Manual on Uniform Traffic Control Devices (MUTCD Section 2B.13).**

The establishment of a speed

Continued on next page

Continued from previous page

limit is required to be based upon an engineering study, and any resulting posting must be in increments of 5 mph. One major basis for the setting of speed limits is that most motorists are able to select a reasonable and safe speed. Using the 85th Percentile speed as a baseline, the proposed speed limit may be adjusted based upon additional factors, including, road characteristics (e.g., shoulder condition, grade, alignment, and sight distance), the pace speed, roadside development and environment, parking practices and pedestrian activity, and reported crash experience.

What is 85th Percentile?

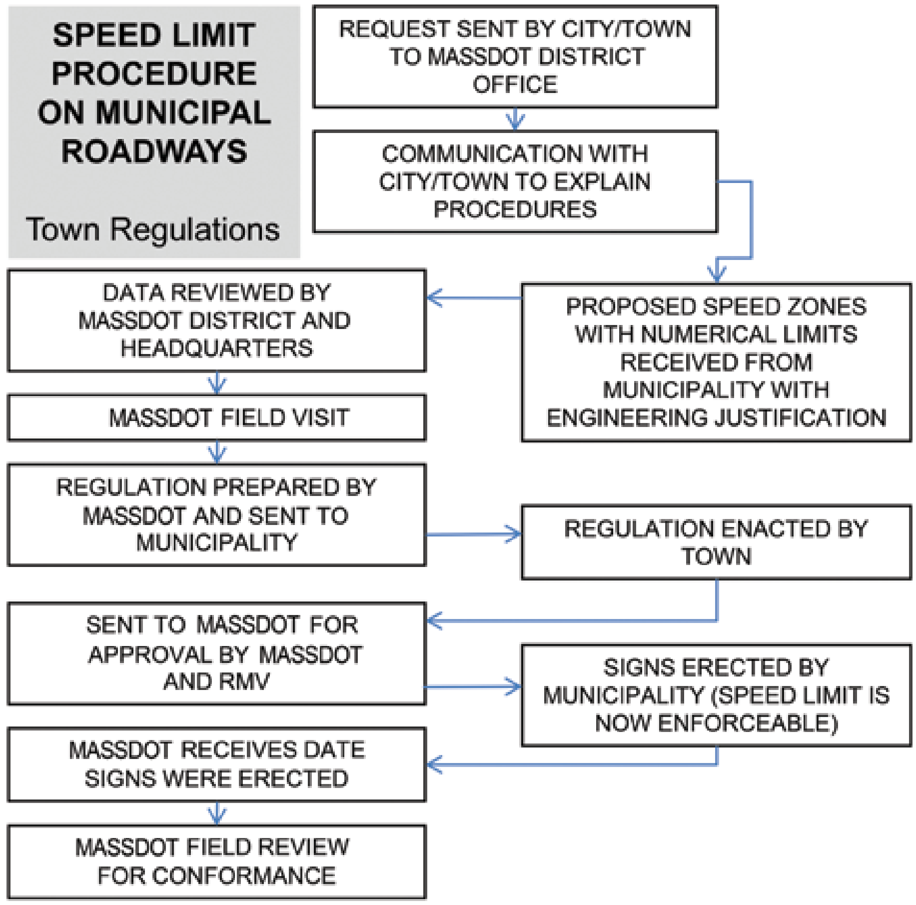
This is the speed at which or below 85% of the vehicles are travelling . Speeds are typically assumed to be normally distributed which results in a probability distribution. Knowing this distribution allows for the targeting of egregious violators. Additionally, studies have shown that as vehicle speeds deviate from the mean the risk of a crash increases; using the 85th percentile method lessens variation of speeds within a traffic stream.

Engineering Study

An engineering study from the municipality must contain both the collected data and analysis of this data. Data collection includes:

1. Preliminary study of conditions;

SETTING SPEED LIMITS



2. Speed calculations of curves (MassDOT's responsibility);
3. Speed observations;
4. Studies of crash distributions; and
5. Trial runs over the location.

Speed observations are determined from a spot speed study and are representative of the motorists "opinion" regarding the speed limit. Speeds from 100 free flow vehicles (drivers choosing their own speed, i.e., not in queue) should be captured in each direction. Data analysis includes:

1. Safe speed range;
2. Selecting speed limits/lengths of zone;
3. Advisory speeds; and
4. Rechecks with trial runs.

Figure 2C-1

Advisory Speeds

Special consideration should always be given to the safe speeds for curves, hills and other locations located within that portion of the section. If the safe speed determined by a Ball-Bank Indicator through a particular curved section of a roadway differs from the preceding speed zone by 10 miles per hour or less, and the curved section of roadway is less than 0.20 miles, or if engineering judgment determines that it is appropriate, a warning sign used in conjunction with an advisory speed plate indicating the safe speed can be used in lieu of establishing a separate speed zone for an isolated condition. Section 2C-08 of the 2009 Manual on Uniform Traffic Control Devices (M.U.T.C.D.) states: Section 2C.08

Table 2C-5

Type of Horizontal Alignment Sign	Difference Between Speed Limit and Advisory Speed				
	5 mph	10 mph	15 mph	20 mph	25 mph or more
Turn (W1-1), Curve (W1-2), Reverse Turn (W1-3), Reverse Curve (W1-4), Winding Road (W1-5), and Combination Horizontal Alignment/Intersection (W10-1) (see Section 2C.07 to determine which sign to use)	Recommended	Required	Required	Required	Required
Advisory Speed Plaque (W13-1P)	Recommended	Required	Required	Required	Required
Chevrons (W1-8) and/or One Direction Large Arrow (W1-6)	Optional	Recommended	Required	Required	Required
Exit Speed (W13-2) and Ramp Speed (W13-3) on exit ramp	Optional	Optional	Recommended	Required	Required

Note: Required means that the sign and/or plaque shall be used, recommended means that the sign and/or plaque should be used, and optional means that the sign and/or plaque may be used.

See Section 2C.06 for roadways with less than 1,000 ADT.

Advisory Speed Plaque (W13-1P)

Option:

01

The Advisory Speed (W13-1P) plaque (see Figure 2C-1) may be used to supplement any warning sign to indicate the advisory speed for a condition.

Standard:

02

The use of the Advisory Speed plaque for horizontal curves shall be in accordance with the information shown in Table 2C-5. The Advisory Speed plaque shall also be used where an engineering study indicates a need to advise road users of the advisory speed for other roadway conditions.

03

If used, the Advisory Speed plaque shall carry the message XX MPH. The speed displayed shall be a multiple of 5 mph.

04

Except in emergencies or when the condition is temporary, an Advisory Speed plaque shall not be installed until the advisory speed has been determined by an engineering study.

05

The Advisory Speed plaque shall only be used to supplement a warning sign and shall not be installed as a separate sign installation.

06

The advisory speed shall be determined by an engineering study that follows established engineering practices.

Unlike regulatory speed signs, advisory speed signs can be erected by municipalities without any further approval provided they comply with the M.U.T.C.D. Also, advisory speeds are not enforceable, since their intent is to advise motorists of an appropriate speed through a particular condition, not regulate it.

Important Reminder!

Advisory speed signage should be used when engineering judgment indicates the need to advise road users of a recommended speed for a given condition (e.g., an exit, a ramp or a curve). Please note that advisory speed limits are not enforceable. Additional information on advisory speed limits is available in the MUTCD Sections 2C. 36 & 2C. 46.

School Zones

The 20 mph speed limit on roads near schools can be posted in various ways. When posting signs, it is important to consider providing motorists with information as to the beginning and end of the school zone as well as when the 20 mph speed limit is in effect. The signs stating such limits may be accompanied by flashing yellow lights or posted for certain hours of the day and days of the week.

Section 7B.15 of the 2009 Manual on Uniform Traffic Control

Continued on next page

Continued from previous page

Devices (M.U.T.C.D.) states: Section 7B.15 School Speed Limit Assembly (S4-1P, S4-2P, S4-3P, S4-4P, S4-6P, S5-1) and END SCHOOL SPEED LIMIT Sign (S5-3)

Standard:

08

The School Speed Limit assembly shall be either a fixed-message sign assembly or a changeable message sign.

09

The fixed-message School Speed Limit assembly shall consist of a top plaque (S4-3P) with the legend SCHOOL, a Speed Limit (R2-1) sign, and a bottom plaque (S4-1P, S4-2P, S4-4P, or S4-6P) indicating the specific periods of the day and/or days of the week that the special school speed limit is in effect (see Figure 7B-1).

Option:

10

Changeable message signs (see Chapter 2L and Section 6F.60) may be used to inform drivers of the school speed limit. If the sign is internally illuminated, it may have a white legend on a black background. Changeable message signs with flashing beacons may be used for situations where greater emphasis of the special school speed limit is needed.

Guidance:

11

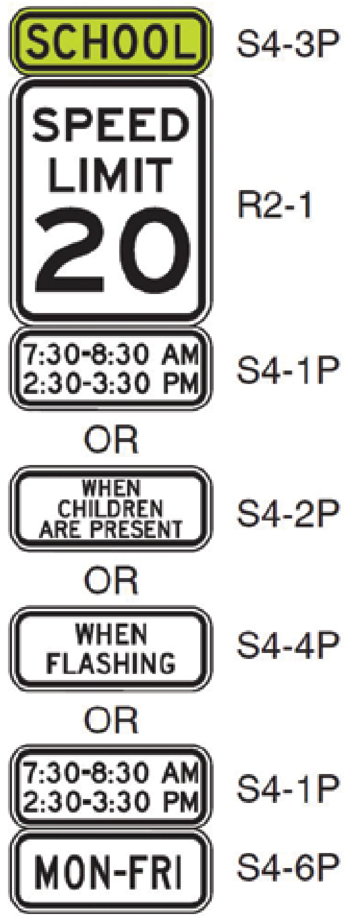
Even though it might not always be practical because of special features to make changeable message signs conform in all respects to the standards in this Manual for fixed-message signs, during the periods that the school speed limit is in effect, their basic shape, message, legend layout, and colors should comply with the standards for fixed-message signs.

12

A confirmation light or device to indicate that the speed limit message is in operation should be considered for inclusion on the back of the changeable message sign.

Figure 7B-1

School Speed Limit Assembly



Resources

Massachusetts Traffic Safety Toolbox Series

This series of fact sheets provides information on safety improvements that can be implemented at the local level. Information on problem areas, possible countermeasures, and implementation considerations is included in each fact sheet which can be found at **www.mass.gov/mhd/safetytoolbox/**

For more information contact: MassDOT Traffic Engineering (617) 973-8484. Last Revised: January 2008

Procedures for Speed Zoning on State and Municipal Roads

These procedures provide specifications for speed zoning in Massachusetts and can be found at **http://www.mhd.state.ma.us/downloads/manuals/speedZoning.pdf**

The Manual on Uniform Traffic Control Devices (MUTCD)

Published by the FHWA, the MUTCD defines the standards used by transportation professionals nationwide to install and maintain traffic control devices on all streets and highways. The most recent version (2003) can be found at **http://mutcd.fhwa.dot.gov/**

The Baystate Roads Program *is a cooperative effort of the Federal Highway Administration, Massachusetts Department of Transportation (MassDOT), and the University of Massachusetts. Program Director, Dr. John Collura, and Program Manager, Dr. Christopher J. Ahmadjian, provide technology transfer assistance to all communities in the Commonwealth. Our purpose is to provide information and training on transportation and related topics, to answer the needs and problems of local agencies, to identify and transfer new technologies and innovations into a usable format, and to operate as a link between transportation research and practicing highway personnel.* ***www.baystateroads.org.***

Enhanced Delineation and Friction for Horizontal Curves

An FHWA Proven Safety Countermeasure

Low-cost safety treatments vary by the severity of the curvature and operating speed. Low-cost treatments typically include methods for warning the driver in advance of the curve, but treatments will vary by intensity of the warning. Implementing the recently published curve treatments included in the Manual on Uniform Traffic Control Devices (MUTCD) should improve curve safety over past practices by providing consistency. However, additional enhancements can be made with post-mounted delineation in the curve or an enhanced signing treatment that may include larger chevron signs with enhanced retroreflectivity. For more challenging curves, dual indicated advanced signs with constant flashing beacons may be effective. Pavement markings are also an effective communication tool to indicate the alignment change. Pavement friction is critical for changing vehicle direction and ensuring the vehicle remains in its lane. Traditional friction courses or high friction surface treatments should be considered for curves with numerous wet weather crashes or severe curves with higher operating speeds.

I-91 Northbound at Chicopee Curve
Photo by Aldo Villani

Background

Horizontal curves are a change in roadway alignment that creates a more demanding environment for the driver, vehicle, and pavement. The challenges associated with safe navigation of horizontal curves compound with the addition of a nighttime driving environment or inclement weather. Recent data analysis shows that 28 percent of all fatal crashes occur on horizontal curves. Furthermore, about three times as many crashes occur on curves as on tangential sections of roadways. These statistics make horizontal curves prime sites for safety improvements.

Early driver perception and appropriate reaction to changes in the roadway greatly improve the safety of the curve. Inconsistent use of warning signs has been identified as an important factor contributing to the high incidence of crashes on curves.

The MUTCD was recently revised to attempt to provide a more uniform application across the United States. Other recent research on signing practices in curves has shown great potential for improving safety with low-cost options. In addition to these treatments, new technologies are being evaluated for challenging curves, such as dynamic advanced curve warning signs and dynamic sequential light-emitting diodes (LED lights) on chevrons.

Each State with identified problems on horizontal curves should review those locations in light of the guidance provided in Section 2C.05 of the 2009 MUTCD to improve consistency within and across jurisdictions.

There are a variety of high-friction surface treatments available. While they typically have a higher unit cost than traditional friction courses, they can often be applied at the specific curve location for a relatively low cost. Additionally, where cross-section problems such as lack of appropriate superelevation exist, this can be a low-cost alternative to address a problem in the short-term until further improvements can be made.

Crash Modification Factors are available from the FHWA Clearinghouse and present effectiveness levels for various horizontal curve treatments. For example:

- Installing chevron signs, curve warning signs, and/or sequential

Rural road in Hadley
Photo by Aldo Villani

Please see CURVES on page 11

Supporting design flexibility to make bicycling and walking safer and more convenient

By Gabe Rousseau
Safety Operations Team Leader, Federal Highway Administration

People in communities across the country are looking for cheaper and more convenient transportation options, and because of this, we're seeing a renewed interest in walking and bicycling. A number of trends are influencing this resurgence, such as young adults waiting to get their drivers licenses (and driving less than previous cohorts); cities and States adopting "complete streets" polices that aim to accommodate the needs of all road users in transportation decisions; and new programs such as car share and bike share, which are creating innovative transportation options. Cities are also experimenting with new signals, markings, and signs to improve the safety and transportation experience for bicyclists and pedestrians. Because of this evolution of the transportation landscape, FHWA offices often receive requests for help in understanding whether a particular facility is allowed by the official design guidelines. Questions like, "Can our city install this new bike design? It's not mentioned in the design guides." Or "Is this pavement marking allowed in the Manual on Uniform Traffic Control Devices, and is it experimental"? are common.

In recent years, a number of unfamiliar bicycle treatments have popped up, and it can be confusing to understand what can and cannot be installed according to design guidelines. Several offices at FHWA have been working to make it easier for people to understand what is permissible, what is experimental, and how much design flexibility there is. Two resources can help practitioners work through these issues and lead to more informed transportation decisions.

The first resource is an FHWA web page (http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_guidance/mutcd_bike.cfm) that lists many of the new bicycle treatments, such as green bike lanes and cycle tracks (i.e., bike lanes that are physically separated from car lanes) and explains their status in the Manual on Uniform Traffic Control Devices (MUTCD) and in the AASHTO Guide for the Development of Bicycle Facilities. The web page is updated regularly when the status of treatments changes or new treatments are identified. People can also find out if there are experiments underway for treatments that are not yet in the MUTCD by looking at the online Official Rulings database, which can be found at http://mutcd.fhwa.dot.gov/orsearch.asp.

The second resource is the FHWA guidance memo (http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_guidance/design_flexibility.cfm) released on August 20, 2013 that stresses the agency's "...support for taking a flexible approach to bicycle and pedestrian facility design." The American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities (aka, "the AASHTO bicycle facilities guide"), the primary national design guideline for bicycle facilities, provides flexibility to encourage facilities

Mixed use trail.
Photos by Aldo Villani

that fit the local context. In 2010, the National Association of City Transportation Officials (NACTO) released the Urban Bikeway Design Guide to augment AASHTO's bicycle facilities guide. Practitioners have had questions about how the NACTO guide should be used, and the August memo clarifies that FHWA supports using both guides to consider options for improving transportation safety and convenience for bicyclists. The memo also explains that similar synergies exist for the AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities and the Institute of Transportation Engineers Designing Urban Walkable Thoroughfares.

FHWA hopes that practitioners will benefit from these two resources and use them to improve the safety and convenience of bicyclists and

Pavement markings and signs.

pedestrians across the country. These resources can help transportation agencies strive towards the goals of the 2010 US DOT Policy Statement on Bicycling and Pedestrian Accommodation which states that "...DOT encourages transportation agencies to go beyond the minimum requirements, and proactively provide convenient, safe, and context-sensitive facilities that foster increased use by bicyclists and pedestrians of all ages and abilities, and utilize universal design characteristics when appropriate." View the policy statement at: http://www.fhwa.dot.gov/environment/bicycle_pedestrian/overview/policy_accom.cfm.

For more information on the FHWA resources available to promote safe bicycling and walking, contact Gabe Rousseau at gabe.rousseau@dot.gov.

Federal Highway Administration Safety Program, Fall 2013: Volume 7 Issue 2

Curves

Continued from page 9

flashing beacons can result in a 38-43 percent reduction in all fatal and injury crashes.

- Installing chevron signs on horizontal curves can produce a 16 percent reduction in non-intersection fatal and injury crashes.
- Installing new fluorescent curve signs or upgrading existing curve signs to fluorescent sheeting can result in 25 percent reduction in non-intersection fatal and injury crashes.
- Providing static combination horizontal alignment/advisory speed signs can generate a 13 percent reduction in all injury crashes.
- Refinishing pavement with microsurfacing treatment can bring about a 43 percent reduction in all fatal and serious injury crashes.

Guidance

Each State with identified problems on horizontal curves should review those locations in light of the guidance provided in Section 2C.05 of the 2009 MUTCD to improve consistency within and across jurisdictions. Additionally, States should review signing practices and policies to ensure they comply with the intent of the new guidance.

Each State should also develop a process for identifying and treating problem curves. This process should consider the full range of available treatments described here and use the appropriate application for the identified problem(s), as noted in the countermeasure description.

Key Resources

Manual on Uniform Traffic Control Devices, FHWA, 2009
http://mutcd.fhwa.dot.gov/

Low-Cost Treatments for Horizontal Curve Safety, 2006, FHWA SA-07-002
http://safety.fhwa.dot.gov/roadway_dept/horicurves/fhwasa07002/

Safety Evaluation of Improved Curve Delineation
http://www.fhwa.dot.gov/publications/research/safety/09045/09045.pdf

AASHTO Highway Safety Manual (Available for purchase from AASHTO)
http://www.highwaysafetymanual.org/pages/default.aspx

Crash Modification Factor (CMF) Clearinghouse [quick search "horizontal curve"]
http://www.cmfclearinghouse.org/

FHWA Contacts
Office of Safety: Joseph Cheung, joseph.cheung@dot.gov, 202-366-6994

FHWA Resource Center: Frank Julian, frank.julian@dot.gov, 404-562-3689
FHWA Web site: http://safety.fhwa.dot.gov/roadway_dept/horicurves/

U.S. Department of Transportation Federal Highway Administration, Office of Safety, FHWA-SA-12-009

Baystate Roads Program
214 Marston Hall
University of Massachusetts
130 Natural Resources Road
Amherst, MA 01003-9293
ST 140031

MASS
Interchange

Mass Interchange is a quarterly newsletter published by The Baystate Roads Program (LTAP). The Local Technical Assistance Program (LTAP) is a national effort of the Federal Highway Administration (FHWA) designed to improve access to highway, road, and street technology for local agencies. Local capabilities and needs differ, and it is the recognition and accommodation of this fact that has been primarily responsible for the program's success. Flexibility in the delivery of technology is a key to responding to the multitude of needs felt by a group as diverse as the local agencies. LTAP is, therefore, based on a policy that employs a national network of technology transfer centers established in partnership with the State highway agencies and staffed with personnel skilled in providing an interface with their respective local constituencies. Because the program relies on input from many sources, inquiries, articles and ideas are encouraged.

To contact the Baystate Roads Program
call (413) 545-2604 or FAX 413-545-6471
mass.gov/baystateroads

MassDOT

Continued from page 1

commitment to improve performance for every mode of travel. It is based on national performance data, MassDOT policies, and robust civic engagement."

The centerpiece of the WMM report is the Planning for Performance tool, which can be used to calculate the performance outcomes that would result from different funding levels available to MassDOT. The tool also begins to incorporate important policy initiatives, such as mode shift and sustainability, in the planning process. WMM analyzes key components of the transportation system: bridges, roadways, buses and trains, railroad tracks and signal, and bike paths. Going forward, the Planning for Performance tool will allow MassDOT to connect its policies, investments, and funding to its customers' needs for a safer and more effective transportation system.

The WMM report is posted online at **www.massdot.state.ma.us/wemove/**. The CIP may be reviewed at **http://www.massdot.state.ma.us/Portals/0/docs/infoCenter/docs_materials/cip_FY14_FY18.pdf**.