

Technical Questions received from persons communicating via the Rumble Strip web site and the responses given by Jim Gowney, FHWA Rumble Strips expert.

- [12/21/98; Greg Mayo, Georgia Department of Transportation](#)

Requested copies of CD-ROM

- [01/11/99; Monique Evans, Ohio DOT](#)

Requested summary of the current practice for installing Rumbles Strips in a travel lane.

- [01/13/99; Karl A. Fredrickson, Nebraska Dept of Roads](#)

Requested examples of milled rumble strips contract specifications

- [01/15/99; Richard C. Moeur, Phoenix, Arizona](#)

Stated concerns with text on bicycle page of web site

- [01/19/99; Dennis Morford, Alaska Dept. of Transportation](#)

Requested experience with rumble strip along center line of roadway

- [01/19/99; Jim Baross, Jr., San Diego, California](#)

Asked that rumble strips be placed in center or roadway and travel lanes instead of shoulders.

- [01/20/99; Steve Kurt, Dunlap, Illinois](#)

Proposed rumble strip be place in the center of the travel lane.

- [01/29/99; Susan Fultz, Iowa Dept. of Transportation](#)

Requested new designs in the pattern of rumble strips that address the safety needs of both the driver and bicyclists.

- [02/02/99; Enrique Dahlhaus](#)

Requested more information regarding rumble strips

- [02/05/99; Bradley J. Smith; Connecticut DOT](#)

Requested information on the use of rumble strips along the centerline.

- [02/04/99; Larry Abston; ACS Safety, Arnold AFB, Tennessee](#)

Requested information on raised rumble strips.

- [02/07/99; Jeffrey A. Scala, PE, Connecticut DOT](#)

Requested information on the use of rumble strips along the centerline.

- [02/08/99; Bruce Wacker, City of Overland Park](#)

Requested information on spacing and dimensions or rumble strips in travel lane

- [02/10/99; Dvir Tamari, Efraim Tamari & Sons, Ltd.](#)

Requested information on companies which install milled rumble strips

- [02/10/99; Brent Dather, FHWA AR Division](#)

Requested a recommended rumble strip design for PC concrete shoulders

- [02/11/99; Jim Douglas, Caltrans](#)

Requested information on proposal to test rumble strips placed longitudinally along the center of the travel lane.

- [02/12/99; David A. Williams](#)

Requested information on increased spacing between the grooves of the milled rumble strip

- [02/25/99; Ken O'Brien, Cybertours](#)

Requested more specific information on New York State Thruway run-off-road crash data.

- [02/26&27/99; Moshe Sheinfeld, Tirat-Hacarmell, Israel](#)

Requested CD-ROM, rumble strip dimensions and companies which install them.

1. Subject: Requested copies of CD-ROM

>>> Greg.Mayo@dot.state.ga.us 12/21 8:50 AM >>>

Jim,

My name is Greg Mayo and I work for the Georgia Department of Transportation.

Please forward to me all information possible regarding the development of a CD-ROM containing technical information for rumble strips. I read about this in a recent issue of Pedestrian Forum.

Thanks...

From: Jim Growney
To: hubsmtpt.hubsmtpt." greg.mayo@dot.state.ga.us"
Date: Tue, Dec 29, 1998 9:55 AM
Subject: Requested copies of CD-ROM

Greg,

FHWA, through its contractor Avalon Integrated Services, is developing a national internet web site intended to provide information on and promote the use of shoulder rumble strips throughout the country. The site is scheduled to go on line by mid-January 1999 at www.ohs.fhwa.dot.gov/rumblestrips. This rumble strip web site is intended to grow and change with new and additional information as others throughout the country become aware of it and wish to include their own experience on use, effectiveness and unique concerns or treatments regarding shoulder rumble strips.

Presently the site is being developed from information FHWA currently has on the policies, standards, specifications and experience of a selected number of states. The site structure will contain sections entitled -

Overview, Effectiveness (studies, reports or material on measured crash reduction experience by various users), Types-Milled, Rolled, Formed and Raised (descriptions with polices, standards and specifications included here), Resources (library, Who's Who, related internet links), Issues (noise, cyclists compatibility, pavement concerns, etc.) and Ask the Expert (rumble strip contacts within FHWA, State Highway Departments and industry). The site will also include a short (15 sec.) video and audio segment of a tractor-trailer truck and automobile traveling over milled-in and rolled-in rumble strips to provide the viewer a relative comparison of these two types.

After the web site has been operational for awhile, we intend to created a CD-ROM of the information on

the site at that time and make it available to those who may prefer this format. We are also investigating the possibility of making a video tape on the use and effectiveness of rumble strips.

For your information the contact name we have for the State of Georgia to include on the web site is Mr. Marion Waters in the GDOT and Dana Robbins in the FHWA Division Office.

Jim Growney, FHWA, Eastern Resource Center-Albany

518-431-4224x212

2. Subject: Requested summary of the current practice for installing Rumbles Strips in a travel lane.

Submitted by (mevans@odot.dot.ohio.gov) on Monday, January 11, 1999 at 08:19:17

email: mevans@odot.dot.ohio.gov

Name: Monique Evans

Company: Ohio DOT

Street: 1980 West Broad Street

City: Columbus

State: Ohio

Zip: 43223

Phone: 614-728-6048

Fax: 614-728-9358

Question: I am interested in getting a summary of the current practice for installing Rumbles Strips in a travel lane as opposed to on the shoulders. Thanks

From: Jim Growney

To: hubsmtpt.hubsmtpt." mevans@odot.dot.ohio.gov"

Date: Mon, Jan 11, 1999 9:19 AM

Subject: Requested summary of the current practice for installing Rumbles Strips in a travel lane.

Monique Evans,

One of the most comprehensive works on rumble strips in the travel lane was done by Douglas W. Harwood and published under the 1993 NCHRP Synthesis of Highway Practice 191, *Use of Rumble Strips to Enhance Safety*. There should be a copy in the ODOT library or you can get a copy through Transportation Research Board.

The primary interest of our Rumble Strip web site was intended to be the safety benefits of shoulder rumble strips in reducing run off the road crashes. However, it is certainly legitimate to discuss travel lane rumble strips as well. I encourage you to pose you question under the Discussion part of the web site to see if we might get a response on the most current practices of travel lane rumble strips. I know some states have place rumble strip down the center lane of undivided roadways to prevent crossover crashes. Also one state was considering placing a narrow rumble strip down the center of a travel lane (2-lane roadway) where there were narrow or no paved shoulders to alert a driver leaving the lane.

If I come across something with more current information, I'll let you know.....Jim Growney

3. Subject: Requested examples of milled rumble strips contract specifications

Submitted by (dor13050@vmhost.cdp.state.ne.us) on Wednesday, January 13, 1999 at 15:27:59

email: dor13050@vmhost.cdp.state.ne.us

Name: Karl A. Fredrickson, P.E.

Company: Nebraska Dept of Roads
Street: 1500 Nebraska Hwy 2
City: Lincoln
State: NE
Zip: 68509-4759

Phone: 402.479.4442
Fax: 402.479.3841

Question: I am looking for contract specifications that have been used on projects. We are planning to let a project on I-80 this spring and add the milled rumble strips to the project.

Who manufactures the machine used for milling? The Department wants to look into the idea of purchasing one.

Thank you for help.

Karl Fredrickson

From: Jim Growney
To: hbsmtp.hbsmtp." dor13050@VMHOST.CDP.STATE.NE.US"
Date: Thu, Jan 14, 1999 11:54 AM
Subject: Requested examples of milled rumble strips contract specifications

Karl,

The rumble strip web site has some state's policies, specifications and drawings under Knowledge-Type-Milled. The states there are FL, KY, MN, NY, PA, SC and WY. In the attached file (as a PDF file) is the milled specification used by NYS DOT, as just one example. I'll send you a hard copy if you can not read this on your computer. A point I would like to make is that we have found states get lower bid costs (\$/ft) the larger the project they bid. The "stand alone" milled projects with large lengths have a better bid price than those bid with a regular (usually shorter) construction project.

One manufacturer of milling machines in Wirtgren America, Inc., (Nashville, TN, 615-391-0600). Also Surface Preparation Technologies, Inc., (Mechanicsburg, PA, 717-697-1450) makes their own milling machines, but they are a contractor/installer who bid on milling projects. I do not know if they sell their machine to others.

I am sure there are other manufactures of milling machines and we do not have a complete listing, nor do we ever expect to have one. The rumble strip web site is intended to be a place where such information can be placed as we become aware of it. At present we have a listing of rumble strip installers provided by ATSSA, which also is not all inclusive, but it is a place to start..

If you have info from Nebraska you would like to share, we would be pleased to put it on the site.

Thanks for your interest.....Jim Growney, 518-431-4224x212

4. Subject: Stated concerns with text on bicycle page of web site

From: RCMoeur@aol.com

To: Gilleran, Brian <FHWA>, Growney, Jim <FHWA>
Date: Fri, Jan 15, 1999 1:29 AM

While I was at the Transportation Research Board meetings earlier this week, I visited a FHWA booth with information on rumble strips.

This booth mentioned that FHWA had a website devoted to the subject of rumble strips, at <http://www.ohs.fhwa.dot.gov/rumblestrips/index.html>

I am a professional engineer with significant experience in traffic engineering, and someone who has personally sealed plan sheets for rumble strip designs and details. I am also involved in the development of the new AASHTO Guide for Development of Bicycle Facilities, and serve on the NCUTCD Bicycle Technical Committee, so I certainly found this site to be of some interest.

I am fully aware of the crash reduction potential that rumble strips can create, especially given the rate of run-off-road crashes in this area of the country. However, the rights of cyclists to safely use the roadway must also be fully taken into account.

Within the site, there is a page focusing on bicycle issues, at [issues/bikeissues.htm](http://www.ohs.fhwa.dot.gov/rumblestrips/index.html#issues/bikeissues.htm)

The text of this page, along with my comments:

Bicyclists and Things That Go Bump on the Road

As vehicles share the roads with increasing numbers of bicycles, highway agencies are reexamining policies about the use and placement of shoulder rumble strips. Although rumble strips can help keep motor vehicles on the road, bicyclists view shoulder rumble strips as safety hazards that can affect their control of their bikes.

True, and well stated.

Bicycles are allowed on some freeways, and most secondary and rural roads. Bicyclists prefer to ride on the shoulders, safely outside the travel lanes.

Your use of the word "safe" concerns me greatly. Bicycling outside the travel lanes consistently reduces only one bicycle-motor vehicle crash type (motorist striking cyclist from behind), which comprises a small percentage of motor vehicle-bicycle collisions, and a very small percentage of total bicycle crashes. However, cycling a distance from the travel lane is significantly correlated with higher crash risk at intersections and driveways, due to drivers not looking for cyclists separated from the general traffic flow (Wachtel and Lewiston, among others). Strongly recommend deleting the use of the word "safe" in this context.

Their main concerns about rumble strips are: 1) riders ability to control the bikes when riders find themselves rolling across or along rumble strips unexpectedly; 2) crossing the rumble strip as they are preparing to make a left turn or move to avoid an obstacle. Riders could move into the travel lane, but that is a dangerous situation for both bicyclists and vehicles.

This statement is fundamentally incorrect for a number of reasons. First, bear in mind that rumble strips are used extensively on non-controlled access highways in Arizona and other states, where many turn lanes, intersections, and driveways exist. Second, many studies have shown that cyclists are at much greater risk of collision if they turn left from the right edge of the road - unless they act as pedestrians, which is inconvenient, slow, and not fully safe in itself.

Finally, this seems to clearly imply that a cyclist should never cross the rumble strip into the travel lane to avoid an obstacle - regardless of the danger that obstacle itself presents to the cyclist.

Shifting to the outside edge of the road shoulder is another alternative, but that often means that bicyclists have to dodge debris on the pavement, which is also hazardous to their safety.

Yes, but you may also want to point out that debris is much more likely to occur at the edge of pavement, due to the "sweeping" effect of traffic.

Road agencies have instituted various policies in the hope of protecting both driver and rider. Many State DOTs prohibit shoulder rumble strips from roads designated as bike routes. Others evaluate the

use of rumble strips on a case-by-case basis and often opt to install them only at locations with histories of run-off-road crashes.

This does not, however, address the states (such as Arizona) that place rumble strips on almost every state highway with sufficient shoulder width - and in some cases, where there isn't sufficient shoulder width for reasonably safe bicycle travel.

Rumble strip design may provide the solution. For example, milled shoulder rumble strips may require a smaller space on the road shoulder than other types of rumble strips. The narrower width of the groove allows room for bicycles to maneuver. Other designs are being investigated such as the use of a skip pattern of rumble strips.

However, this is more than offset by the fact that the milled-in rumble strips have a much greater negative effect on cyclists. This is due to the fact that the groove width and depth on these milled-in rumble strips causes the entire bicycle tire to drop fully into the groove, causing a significant up-and-down motion of the entire bicycle (as attested to from personal experience).

Contrast this to the "tractor-tread" style of rumble strip, where the bicycle tire rides over the top of the indentation, causing much less vertical motion and instability.

I am involved with an upcoming test of a rumble strip test pattern where a 12 inch wide and 3/8 inch deep milled-in rumble strip will be installed in a 40 foot rumble / 20 foot gap pattern. This should provide spaces for cyclists to leave the shoulder without striking the rumble strip, while ensuring that an errant vehicle has no chance of avoiding the rumble - unless the departure angle is so steep that no rumble strip can possibly help.

The main point is that road agencies are working closely with their various constituencies to solve the problems

As noted above, this is very inconsistent across transportation agencies. Making a blanket statement such as the one above greatly understates the concerns that cyclists have with their agencies' use of rumble strips. And the most obvious solution is communicating the location of rumble strips with RUMBLE STRIPS AHEAD signs so that bicycle riders are not surprised when they encounter them.

Making a statement that a sign of this type is a desirable solution in the absence of research showing that such a sign will be effective is very shortsighted and may not be defensible on technical grounds. First, such a sign would be worthless where rumble strips are placed continuously, such as on highways in many states. Second, such signs would only add to sign clutter, and reduce the effectiveness of other more critically needed signs and devices.

Third, this places a significant extra maintenance burden upon agencies to place and maintain signs. Fourth, this may open an avenue for potential liability if an agency fails to place or maintain such signs. Finally, the sign does nothing to mitigate the direct effect that rumble strips have on bicycle traffic.

Please feel free to contact me if you have any questions or comments.

Richard C. Moeur, P.E., WC7RCM, E.C.I., whatever...Practicing Traffic Engineer (I'll get it right someday...) Phoenix, Arizona, USA "Life is just one W1-5 after another, until the W14-1"

The opinions expressed are not necessarily those of the Arizona Department of Transportation. Really. Now Open: <http://members.aol.com/rcmoeur/>:9

CC: Fegan, John <FHWA>

5. Subject: Requested experience with rumble strip along center line of roadway

Submitted by (dennis_morford@dot.state.ak.us) on Tuesday, January 19, 1999 at 18:50:13

email: dennis_morford@dot.state.ak.us
Name: Dennis Morford
Company: Alaska Dept. of Transportation
Street: P.O. Box 196900
City: Anchorage
State: Alaska
Zip: 99515

Phone: 907-269-0639
Fax: 907-269-0654

Question: We are planning a large areawide project to install milled-in rumble strips on our rural highways. One of the problems I hope to solve with shoulder rumble strips, in addition to reducing run-off-road crashes, is to preserve the pavement edge line. One of our biggest problems with pavement marking retention is drivers "smoothing out" horizontal curves by running onto the inside shoulder thereby wearing out the edge line on the inside of the curve. Of course, on horizontal curves the centerline also gets worn off by vehicles travelling in the opposite direction. My question is do you have any experience or know of a place where milled-in rumble strips have been used on centerline? Our thought is to put them on the centerline of all horizontal curves from PC to PT. Any help or direction you can give will be greatly appreciated. Thanks

From: Jim Growney
To: hubsmtplib.hubsmtplib."dennis_morford@dot.state.ak.us"
Date: Wed, Jan 20, 1999 9:11 AM
Subject: Requested experience with rumble strip along center line of roadway

Dennis,

Delaware is one state I am aware of which has installed a rumble strip on the center line of (I believe) a two lane highway (SR 896). In their October 1997 HSIP report they indicate that a "...centerline grooving experiment on SR 896 was designed and implemented to reduce crossover accidents. Six fatalities during the prior three years [about 1993-1995] were recorded along this roadway before the new design was completed. Zero fatalities have been recorded in this same stretch of the roadway within one year after completion." Two contact names we have for Delaware on this subject are shown below. You might give them a call and find out the specifics of their experience.:

Randall E. Grunden

Safety Management; Division of Planning
Delaware DOT
302-739-4502
302-739-2251 FAX
David W. Matsen, P.E., Assistant Director
Office of Transportation Planning
Division of Planning
Delaware DOT
302-739-5618
302-739-2251 FAX

I believe the States of Maryland and Colorado have also installed rumble strips on some center lines, but I have no specific information on those experiences.

Another contact is Doug Johnson 717-697-1450 of Surface Preparation Technologies, Inc. in Mechanicsburg, PA. His company has installed milled-in center line rumble strips along with a significant amount of milled-in shoulder rumble strips.

The purpose of rumble strips installation is to reduce run-off-road crashes (or head-on crashes in the case of center line strips) which in turn reduces traffic fatalities and serious injuries. The experience of states installing strips has shown them to be very effective in reducing these crashes. I have not heard of any state using them to preserve their pavement markings. Keeping traffic off the pavement marking may be a by-product of the presence of a rumble strip, but their installation should not be for that purpose.

You could put a question about center line usage on the Discussion part of our Rumble Strip web site to see what responses you may get from around the country. Also we do not have a rumble strip contact listed for the Alaska DOT on our web site. Could we use your name as a contact or is there some one else's name in the department you could offer.

Thanks.....Jim Growney

6. Subject: Asked that rumble strips be placed in center or roadway and travel lanes instead of shoulders

Submitted by (JBaross@cts.com) on Tuesday, January 19, 1999 at 00:41:55

email: JBaross@cts.com

Name: Jim Baross, Jr.

Company: volunteer Caltrans Bicycle Advisory Committee

Street: 3335 North Mtn. View Dr

City: San Diego

State: California

Zip: 92116

Question: I commute by bicycle to work, for most errands and for much of my recreation both on my own, with bicycle clubs and with my family - wife and two boys, 8 and 11. I am informed by bicyclists who have encountered rumble strips that they found them to be a safety hazard to their use, legal use, of the roadway. I would like to know why the comfort and safety of bicyclists - legal and desirable mode of travel is being threatened to help keep drowsy motorists on the road? Wouldn't it be cheaper and more effective to keep drowsy motorists off the road? Also, are rumble strips being considered for placement in the center of the road, between lanes of opposing direction traffic? Isn't a head-on collision more threatening? Further, if rumble strips must be placed on the road, how about putting them in the middle of the lane? Thereby also providing a warning to the drowsy motorist of movement to either direction? Placement in the middle of the lanes would inconvenience bicyclists less, would warn motorists more often, and could be easily avoided by motorcyclists who do not normally ride on the center, oil slick, areas anyway.

Thanks.

From: Jim Growney

To: hubsmtpt.hubsmtpt.@JBaross@cts.com

Date: Fri, Jan 22, 1999 4:45 PM

Subject: Asked that rumble strips be placed in center or roadway and travel lanes instead of shoulders.

Mr. Jim Baross, Jr.:

Thank you for taking the time to share your comments on rumble strips with us.

State highway agencies presently installing rumble strips are aware of the concerns and problems these strips pose for the bicycle traveler. They are also aware of the great benefit this safety treatment provides in reducing the number of run-off-road crashes which result in fatalities and serious injuries. About one third of our country's traffic fatalities are due to run-off-road crashes. Most of these agencies

are working to find solutions to the identified problems for the cyclists and still be able use this highly effective safety treatment.

One of the purposes of this internet web site is to provide a means of sharing information and experiences from around the country so all users can benefit from the ideas, knowledge and experiences of others.

You mentioned the possibility of using rumble strips along the center line of undivided highways. A few of our states have installed rumble strips in this manner to help reduce the number of cross over and head-on crashes. Other states are becoming aware of this experience and considering such installations where it may prove beneficial for their needs.

You also mentioned placing the strips in the middle of the travel lane. A least one state is considering such a treatment as a possibility and will soon be entering into a contract with their state university to study this design. Such an installation is initially seen as a why of alerting drowsy or inattentive drivers when they deviate from the travel way in those areas where there is insufficient room on the shoulder to provide for the strip and a bicycle travel way or where the shoulder is unpaved. There is concern at this point about imposing a possible hazard in the travel way to motorcycle drivers, especially those towing trailers, and to other drivers in general who may be unsafely distracted by the presence of an extended textured strip along the middle of their travel path.

Regarding our concern for the bicyclist, selection of a particular rumble strip design or revisions to current designs may provide part of the solution. For example, milled shoulder rumble strips may require a smaller space on the shoulder than other types of rumble strips. The narrower width of the strip allows more shoulder room for the bicyclist to maneuver on the right side of the shoulder. Other designs are being used and investigated such as the use of a skip pattern of rumble strips which would allow a smoother travel path for the bicyclists to move to the left of the strip when needed.

Thanks again for you interest.....Jim Growney

7. Subject: Proposed rumble strip be place in the center of the travel lane.

Submitted by (kurt.steven.j@cat.com) on Wednesday, January 20, 1999 at 14:13:59

email: kurt.steven.j@cat.com

Name: Steve Kurt

Street: 12300 Brentfield Dr., #221

City: Dunlap

State: IL

Zip: 61525

Phone: 309-243-7684

Question: Dear Mr. Griffith,

I posted a message in the "bikes and rumble strips" section of the rumble strip website (<http://www.ohs.fhwa.dot.gov/rumblestrips/>). I proposed moving the rumble strip from the shoulder, where it interferes with bicycle traffic, to the center of the traffic lane. As I see it, it still provides a warning to the driver if the car approaches the edge of the roadway, but it also provides a warning when drifting to the left and into either oncoming traffic or adjacent lanes of traffic. Is there a drawback to this proposal that I'm not aware of? Would this idea be considered for evaluation and use?

best regards,

Steve Kurt

From: Jim Growney

To: hubsmtplib.hubsmtplib. AKurt_steven_j@cat.com

Date: Sun, Jan 24, 1999 7:39 PM

Subject: Proposed rumble strip be place in the center of the travel lane.

Mr. Steve Kurt,

Thank you for taking the time to share your comment on placing the rumble strip along the center of the travel lane with us.

State highway agencies presently installing rumble strips are aware of the concerns and problems these strips pose for the bicycle traveler. They are also aware of the great benefit this safety treatment provides in reducing the number of run-off-road crashes which result in fatalities and serious injuries. About one third of our country's traffic fatalities are due to run-off-road crashes. Many of these crashes are attributed to drowsy or inattentive driving which have been reduced after the installation of shoulder rumble strips. Most are working to find solutions to the identified problems for cyclists and still be able use this highly effective safety treatment.

At least one State Department of Transportation has been considering the possibility of installing a rumble strip along the center of the travel lane and will soon be entering into a contract with its state university to study this design. Such an installation is seen as a way of alerting drowsy or inattentive drivers when they deviate from their travel way where there is insufficient room on the shoulder to provide for the strip and the bicyclist or where the shoulder is unpaved. There is concern at this point about introducing a possible hazard in the travel way to motorcycle drivers, especially those towing trailers, and to other drivers in general who may be unsafely distracted by the presence of an extended textured strip along the middle of their travel path.

Other options are being considered to address the concern for the bicycle traveler. The selection of a particular shoulder rumble strip design or revisions to current designs may provide part of the solution. For example, milled rumble strips usually require a smaller width of space on the shoulder than other types of strips. The narrower width allows more shoulder room for the bicyclist to maneuver on the right side of the shoulder. Also designs are being used and investigated which use a skip pattern of rumble strips that provide a smoother travel path throughout portions of the rumble strip for bicyclists to move to the left when needed.

One of the purposes of this internet web site is to provide a means of sharing information and experiences from around the country so all users can benefit from the ideas, knowledge and experiences of others. We hope through this effort all highway agencies will find a source of additional information to help in safely providing for the travel of all of our roadway users.

Thank you again for your comment.....Jim Growney

8. Subject: Requested new designs in the pattern of rumble strips that address the safety needs of both the driver and bicyclists.

Submitted by (sfultz1@yahoo.com) on Thursday, January 21, 1999 at 09:29:46

email: sfultz1@yahoo.com

Name: Susan Fultz

Company: Iowa Dept. of Transportation

Street: 800 L'Way

City: Ames

State: Iowa

Zip: 50010

Phone: 515-239-1076

Fax: 515-239-1891

Question: Has there been in new designs in the pattern of rumble strips that address the safety needs of

both the driver and bicyclists?

From: Jim Growney

To: hubsmtpt.hubsmtpt." sfultz1@yahoo.com"

Date: Sun, Jan 24, 1999 8:33 PM

Subject: Requested new designs in the pattern of rumble strips that address the safety needs of both the driver and bicyclists.

Ms. Susan Fultz,

Thank you for your question about new designs in the pattern of rumble strips that address the safety needs of both the driver and bicyclists..

State highway agencies presently installing rumble strips are aware of the concerns and problems these strips pose for the bicycle traveler. They are also aware of the great benefit this safety treatment provides in reducing the number of run-off-road crashes which result in fatalities and serious injuries. About one third of our country's traffic fatalities are due to run-off-road crashes. Many of these crashes are attributed to drowsy or inattentive driving. The number of such crashes have been shown to be reduced after shoulder rumble strips were installed. Most agencies are working to find solutions to the identified problems for the cyclists and still be able use this highly effective safety treatment.

Options are being considered to address the concerns for the bicycle traveler. The selection of a particular shoulder rumble strip design or revisions to current designs may provide part of the solution. For example, milled shoulder rumble strips usually require a smaller width of space on the shoulder than other types of strips. The narrower width of the strip allows more shoulder room for the bicyclist to maneuver on the right side of the shoulder. Also, designs are being used and investigated which use a skip pattern of rumble strip that provide a smoother travel path throughout portions of the strip for bicyclists to move to the left when needed.

We are aware that the Pennsylvania Department of Transportation presently has a contact with Pennsylvania State University to study and to make recommendations on the compatibility concerns of the bicycle traveler and the presence of shoulder rumble strips. Also, the Federal Highway Administration and the American Association of State Highway and Transportation Officials have proposed a pooled-fund study entitled, "Rumble Strips Compatible with Bicyclists" for Fiscal Year 2000. Initiation and undertaking of this study will depend on a number of states being able to commit their participation to this effort..

A few of our states have installed rumble strips along the center line of undivided highways to help reduce the number of cross over and head-on crashes. Other states are becoming aware of this experience and considering such installations where it may prove beneficial for their needs.

At least one State Department of Transportation has been considering the possibility of installing a rumble strip along the center of the travel lane and will soon be entering into a contract with its state university to study this design. Such an installation is seen as a way of alerting drowsy or inattentive drivers when they deviate from the travel way where there is insufficient room on the shoulder to provide for the strip and the bicyclist or where the shoulder is unpaved. There is concern at this point about introducing a possible hazard in the travel way to motorcycle riders, especially those towing trailers, and to other drivers in general who may be unsafely distracted by the presence of an extended textured strip along the middle of their travel path.

One of the purposes of this internet web site is to provide a means of sharing information and experiences from around the country so all users can benefit from the ideas, knowledge and experiences of others. We hope through this effort all highway agencies will find a source of additional information to help in safely providing for the travel of all of our roadway users. For your information, Mr. Tom Welch has been identified on this web site as the contact person for the Iowa Department of

Transportation.

Thank you for your interest.....Jim Growney

9. Subject: Requested more information regarding rumble strips

>>> veycosacv@iserve.net.mx 02/02 12:43 PM >>>

Dear Mr. Growney.

I read with great interest the article "Rumble Strips" in the Public Roads Magazine and I would like to know more about this development.

Please e-mail me more information regarding Rumble Strips.

Best personal regards.

Mr. Enrique Dahlhaus

From: Jim Growney

To: hubsmtpl@veycosacv@iserve.net.mx

Date: Wed, Feb 3, 1999 9:35 AM

Subject: Requested more information regarding rumble strips

Dear Mr. Dahlhaus:

Thank you for your interest in the rumble strip article, "A Silver Bullet: Shoulder Texture Treatments", published in the January/February 1999 issue of Public Roads. That article was written by Ann Walls of the Federal Highway Administration's (FHWA) Headquarters Office in Washington D.C. This article, as you may note, contains a good deal of information about the use of shoulder rumble strips along our nation's highways. Several studies have shown the great benefit this safety treatment provides in reducing the number of run-off-road crashes, many of which often result in fatalities and/or serious injuries. About one third of our country's traffic fatalities are caused by run-off-road crashes. Many of these crashes are attributed to drowsy or inattentive drivers. Several States have shown that such crashes are reduced after shoulder rumble strips were installed

In addition to this article and other publications, the FHWA, through its Headquarters Offices of Technology Application and Highway Safety, is sponsoring an Internet web site dedicated to sharing information and experience on this highly effective traffic safety treatment. The web site is organized in a manner to promote sharing of information through a Community of Practice which addresses the three main elements of Knowledge, People and Communication. On the web site each element is color-coded for ease of navigation. Logically organized, the site includes overviews, effectiveness and evaluations, types (including user specifications), issues, and resources. There are pictures and even brief audio clips. This community has the most current information and state-of-the-practice resources from FHWA, State DOTs, and providers leading to good practices. This rumble strip site may be accessed at, <http://www.ohs.fhwa.dot.gov/rumblestrips> . The site continues to grow each day, since its January 8, 1999 start date, with additional information from others around the country who wish to contribute to this Community of Practice.

I invite you to visit this web site to see what information is available there. If you have more specific questions on the use and effectiveness of shoulder rumble strips, you are welcome to contact me again or one of the many other names identified on the web site as rumble strip contacts.

Jim Growney

Highway Safety Engineer
Eastern Resource Center, Albany, NY

10. Subject: Requested information on using rumble strip along the center line.

Submitted by (bradley.smith@po.state.ct.us) on Friday, February 5, 1999 at 11:01:24

email: bradley.smith@po.state.ct.us
Name: Bradley J. Smith
Company: CT DOT
Street: 2800 Berlin Tpke
City: Newington
State: CT
Zip: 06111
Phone: 860-594-3272
Fax: 869-594-3218

Question: Ct is considering using rumble strips along the centerline of a 2 lane undivided rural arterial to reduce possible head on collisions. Do you know of anyone who has used centerline rumble strips ? We are intersted in specs and results. Thanks

From: Jim Growney
To: hubsmtpl.hubsmtpl.@bradley.smith@po.state.ct.us@
Date: Fri, Feb 5, 1999 3:45 PM

Subject: Requested information on using rumble strip along the center line

Dear Mr. Bradley J. Smith,

Delaware is one state I am aware of which has installed a rumble strip on the center line of a two-lane highway (SR 896). In their October 1997 HSIP report they indicate that a "...centerline grooving experiment on SR 896 was designed and implemented to reduce crossover accidents. Six fatalities during the prior three years [about 1993-1995] were recorded along this roadway before the new design was completed. Zero fatalities have been recorded in this same stretch of the roadway within one year after completion." Two contact names we have for Delaware on this subject are shown below. You might contact them and find out the specifics of their experience.:

Randall E. Grunden
Safety Management; Division of Planning
Delaware DOT
302-739-4502
302-739-2251 FAX

David W. Matsen, P.E., Assistant Director
Office of Transportation Planning
Division of Planning
Delaware DOT
302-739-5618
302-739-2251 FAX

I believe the States of Maryland and Colorado have also installed rumble strips on center lines of two-lane roadways, but I have no specific information on those experiences. There are State DOT contact names on the web site page under Ask the Expert section. Alaska is also considering placing center line rumble strips.

Another contact is Doug Johnson 717-697-1450 of Surface Preparation Technologies, Inc. in

Mechanicsburg, PA. His company has installed milled-in center line rumble strips along with a significant amount of milled-in shoulder rumble strips. Doug has placed a message on our web page discussion section where he states, "A number of states have begun installing 16-inch wide rumble strips down the center line of two lane roads. The purpose of the center line rumble strips is to prevent drivers from crossing the center line and creating a head-on crash. Our company has completed a number of these projects. This has no adverse impact on the visibility of the center line, which is painted through the rumble strip. In fact in rainy conditions at night, the rumble strips can enhance the visibility of the center lines a great deal by angle the reflective painting back toward the on-coming headlights on the rising curve of the rumble strips. "

We are interested in receiving any information the ConnDOT may wish to share on the web site. I know you have a web location where the State has identified highways to receive rumble strip under your continuing program. We would like to include any e-files of policies, standards, drawings or study reports you may have to share. Our CT Division office had asked Walt Coughlin if he wished his name or someone else be placed on the web site contact list for CT, but he declined at this time. If ConnDOT does wish to be included on the list, we would be please to include such a contact reference for the State.

Thank you.....Jim Growney, 518-431-4224x212, FHWA, Albany, NY

11. Subject: Requested information on raised rumble strips.

From: ABSTON@hap.arnold.af.mil
To: Griffith, Mike <FHWA>
Date: Thu, Feb 4, 1999 1:26 PM
Subject: Rumble Strips

Dear Sir,

I am looking for data on the use of raised strips (rumble strips) on pavements at the approach to stop signs at intersections to alert vehicle operators to prepare to stop. some of the questions are: What is the feasibility for them?; Are they safe?; Do they interfere with maintenance?; Are there any records of contributing to a motor vehicle accident? If there is information on the internet I can access, please let me know, or if there is any printed matter, I can arrange to order copies.

My address:

Larry Abston
ACS Safety
675 2nd Street
Arnold AFB, TN 37389-4500
e-mail: abston@hap.arnold.af.mil

Thank you, Larry Abston

DSN: 340-3623

Commercial (931) 454-3623

From: Mike Griffith
To: FH01RGDO.fh01rgpo.JGROWNEY
Date: Fri, Feb 5, 1999 4:50 PM
Subject: Rumble Strips -Forwarded

Jim - I responded to the attached question by referring the individual to NCHRP Synthesis Report #191("Use of Rumble Strips to Enhance Safety").

Thanks- Mike

12. Subject: Requested information on the use of rumble strips along the centerline.

Submitted by (jascala@email.msn.com) on Sunday, February 7, 1999 at 23:26:16

email: jascala@email.msn.com

Name: jeffrey a scala,pe

Company: connecticut dot

Street: 2800 berlin turnpike

City: newington

State: connecticut

Zip: 06131

Phone: 860.594.2075

Fax: 860.594.3375

Question: do you have any information about the use of milled rumble strips in the center of a two lane road? Would they be effective in reducing the number of cross over and head-on accidents. What is the minimum effective width? where should the yellow lines be installed? any information you may have would be greatly appreciated thanks jeff

From: Jim Growney

To: hubsmtpl.hubsmtpl@jascala@email.msn.com

Date: Wed, Feb 10, 1999 3:48 PM

Subject: Requested information on the use of rumble strips along the centerline.

Dear Mr. Jeffrey Scala,

In response to your question about about the use of rumble strip in the center of two-lane roadway, please see the following. This information was also provided to Mr. Bradley Smith of ConnDOT on 2/5/99.

Delaware is one state I am aware of which has installed a rumble strip on the center line of a two-lane highway (SR 896). In their October 1997 HSIP report they indicate that a "...centerline grooving experiment on SR 896 was designed and implemented to reduce crossover accidents. Six fatalities during the prior three years [about 1993-1995] were recorded along this roadway before the new design was completed. Zero fatalities have been recorded in this same stretch of the roadway within one year after completion." Two contact names we have for Delaware on this subject are shown below. You might contact them and find out the specifics of their experience:

Randall E. Grunden
Safety Management; Division of Planning
Delaware DOT
302-739-4502
302-739-2251 FAX

David W. Matsen, P.E., Assistant Director
Office of Transportation Planning
Division of Planning
Delaware DOT
302-739-5618
302-739-2251 FAX

I believe the States of Maryland, Colorado and Washington have also installed rumble strips on center lines of two-lane roadways, but I have no specific information on those experiences. There are State

DOT contact names on the web site page under Ask the Expert section. Alaska is also considering placing center line rumble strips.

Another contact is Doug Johnson 717-697-1450 of Surface Preparation Technologies, Inc. in Mechanicsburg, PA. His company has installed milled-in center line rumble strips along with a significant amount of milled-in shoulder rumble strips. Doug has placed a message on our web page discussion section where he states, "A number of states have begun installing 16-inch wide rumble strips down the center line of two lane roads. The purpose of the center line rumble strips is to prevent drivers from crossing the center line and creating a head-on crash. Our company has completed a number of these projects. This has no adverse impact on the visibility of the center line, which is painted through the rumble strip. In fact in rainy conditions at night, the rumble strips can enhance the visibility of the center lines a great deal by angle the reflective painting back toward the on-coming headlights on the rising curve of the rumble strips. "

We are interested in receiving any information the ConnDOT may wish to share on the web site. I know you have a web location where the State has identified highways to receive rumble strip under your continuing program. We would like to include any e-files of policies, standards, drawings or study reports you may have to share. Our CT Division office had asked Walt Coughlin if he wished his name or someone else be placed on the web site contact list for CT, but he declined at this time. If ConnDOT does wish to be included on the list, we would be please to include such a contact reference for the State.

Thank you.....Jim Growney, 518-431-4224x212,

FHWA, Albany, NY

13. Subject: Requested information on spacing and dimensions of rumble strips in travel lane

Submitted by (blwacker@opkansas.org) on Monday, February 8, 1999 at 17:39:47

email: blwacker@opkansas.org

Name: Bruce Wacker
Company: City of Overland Park
Street: 8500 Santa Fe Drive
City: Overland Park
State: Kansas
Zip: 66212
Phone: (913) 895-6027
Fax: (913) 895-5055

Question: What is the spacing criteria between sets of rumble strips when used on the actual driving surface to warn motorists of an impending change, i.e. stop sign? How far away should the first set of rumble strips be from the actual changed condition? How long should each set of rumble strips be (how many grooves per set)?

From: Jim Growney
To: hubsmtpl.hubsmtpl@blwacker@opkansas.org
Date: Tue, Feb 9, 1999 10:46 AM
Subject: Requested information on spacing and dimensions of rumble strips in travel lane

Dear Mr. Wacker,

For one of the most extensive works on the use of rumble strips in the travel lane, especially approaching intersections, I refer you to a report done by Douglas W. Harwood of the Midwest Research Institute in Kansas City, Missouri. The report is contained in National Cooperative Highway Research

Program's (NCHRP) Synthesis of Highway Practice 191, titled, "Use of Rumble Strips to Enhance Safety", 1993. This report may be obtain from the Transportation Research Board, P.O. Box 289, Washington D.C. 20055; telephone 202-334-3214; telefax.202-334-2519.

The report provides the spacing and number of strip patterns per approach for a number of State highway agencies. The practice varies from 2 to 10 patterns with strip locations beginning (as measured from the intersection) for some States from 200 ft before the intersection up to 2000 ft from the intersection. Distance and number of strips often depend upon approach speed. The information shown for Kansas is three rumble strip patterns; one at 1350 ft from the intersection, the second at 1450 ft and the third at 1550 ft. STOP AHEAD signs are located at 550 ft and 1250 ft from the intersection.

Here are two of several conclusions from Mr. Harwood's report regarding the use of rumble strips in the traveled way.

"Rumble strips in the traveled way are warning devices intended to alert drivers to the possible need to take some action, but the driver must decide what action is appropriate. Signing may be used in conjunction with rumble strips to help the driver determine the appropriate action (e.g., STOP AHEAD sign, horizontal curve warning sign, speed limit sign, etc.). Rumble strips in the traveled way should be placed so that either the upcoming decision point, or a sign identifying the potentially required action is clearly visible as the driver passes over the rumble strip. Rumble strips should be placed in advance of decision points so that drivers have adequate time to take any required action."

"Rumble strips placed in the traveled way should not be overused. If rumble strips are used at too many locations they may lose their ability to gain the motorist's attention. Rumble strips placed in the traveled way are most desirable at locations where there is a documented accident problem and where more conventional treatments - such as signing - have been tired an found to be ineffective. At a few locations, it may be desirable to install rumble strips in the traveled way, even where there is no documented accident history, if accident problems have been encountered at similar locations."

Thank you for your interest.....Jim Growney,

Highway Safety Engineer, FHWA, Eastern Resource Center.

14. Subject: Requested information on companies which install milled rumble strips

Submitted by (tamari_e@netvision.net.il) on Wednesday, February 10, 1999 at 06:49:38
email: tamari_e@netvision.net.il

Name: Dvir Tamari
Company: Efraim Tamari & sons ltd
Street: Industrial zone p.o.box 50
City: Asseret
State: ISRAEL
Zip: 76858

Phone: 972-8-8596871
Fax: 972-8-8598951

Question: EFRAIM TAMARI & SONS IS A CONTRACTORS COMPANY IN ISRAEL AT THIS POINT I'M LOOKING FOR COMPANIES THAT PRODUCES MACHINES FOR THE RUMBLE STRIPS. I WILL BE VERY HAPPY IF YOU CAN HELP ME WITH THIS INFORMATION.

From: Jim Growney

To: [hubsmtpt.hubsmtpt."tamari_e@netvision.net.il"](mailto:hubsmtpt.hubsmtpt.tamari_e@netvision.net.il)
Date: Wed Feb 10, 1999 3:48 PM

Subject: Requested information on companies which install milled rumble strips

Dear Dvir Tamari,

The Federal Highway Administration does not endorse or advocate for any particular transportation/highway manufacturer, supplier or contractor. However, through the Internet web site on rumble strips you visited, we included, as a service, a listing of some contractors and installers of rumble strips which was provided by the American Traffic Safety Services Association, 5440 Jefferson Davis Highway, Fredericksburg, Virginia 22407-2673; 540-898-5400. You may find this list at <http://www.ohs.fhwa.dot.gov/rumblestrips/> in the section titled Resources and then to Who's Who where you may find Rumble Strip Providers.

We are also aware of other manufactures of equipment such as:

Wirtgen America Inc.
204 River Hills Drive
Nashville, Tenn., 37210; USA
voice (615) 391-0600
fax (615) 391-0791
<http://www.wirtgenamerica.com/tech8.html>

and

Surface Preparation Technologies, Inc.
81 Texaco Road
Mechanicsburg, PA 17055
Phone: 717/697-1450 FAX: 717/697-0813
<http://www.spt.addr.com/>

and

THOMAS GRINDING INC
P.O. Box 1083
1111 Riverside Dr.
Moore Haven, FL 33471-1083
Phone (941) 946-1461
FAX (941) 946-1448
<http://www.gate.net/~tgi/>

Also you may check with

Pavement Construction, Maintenance, Recycling and Materials
724 N. Mercer Street
Decatur, Illinois 62522-1699
Telephone: 217/429-4444 Fax: 217/429-7917
<http://www.dunnco.com/roto.html>

Thank you for your interest.....Jim Growney,

Federal Highway Administration
Eastern Resource Center

From: Jim Growney
To: hubsmtpt.hubsmtpt."tamari_e@netvision.net.il"
Date: Fri, Feb 19, 1999 10:18 AM

Subject: Requested information on companies which install milled rumble strips

Dear Dvir Tamari,

As a follow up of my 2/10/99 e-mail to you on manufactures of shoulder rumble strip milling equipment, I would like to add the following equipment manufacturer to the three or four I sent you earlier:

Dickson Industries Incorporated
P.O. Box 684
Tecumseh, Oklahoma 74873
Phone 405-598-6547
405-598-6549 FAX

Thank you for your interest.....Jim Growney, Federal Highway Administration,
Eastern Resource Center

15. Subject: Requested a recommended rumble strip design for PC concrete shoulders

Submitted by (brent.dather@fhwa.dot.gov) on Wednesday, February 10, 1999 at 17:55:56

email: brent.dather@fhwa.dot.gov

Name: Brent Dather
Company: FHWA, AR Division
Street: 700 W. Capitol, Box 3130 Federal Bldg.
City: Little Rock
State: AR
Zip: 72201-3298
Phone: (501) 324-6424
Fax: (501) 324-6423

Question: Mike, we are rebuilding some of our Interstate and expect, pending legislation, to reconstruct around 350 miles of it in a very ambitious program. Much of it is being constructed, and will likely be constructed, with concrete shoulders. The ground in design (7" wide grooves, 12" spacing) is a great concept, particularly for 18-wheelers and hot-mix shoulders. However, I doubt that when AHTD legislation \$\$ are finalized and they are able to commit to a programmatic rumblestrip retrofit, that they will want to "redo" all their concrete shoulders (which are constructed with formed corrugations) due to "already having rumblestrips" not to mention the higher cost of cutting them into concrete. It looks to me like, for basically zero extra cost, we could right now be forming more effective corrugations into our concrete shoulders. The AHTD standard is 4ft strips every 100ft. Corrugations are 4-1/2" crest to crest, 1" deep. Fairly effective on cars but, along the line! s of the theory of milled in strips, probably are not effective on trucks. I have discussed this with the AHTD and they are very willing to look at improvements to the current standard and would like look at any improved design we could show them. This brings me to my question. Do you have, or know of a good, recommended design on formed in rumblestrips for concrete shoulders? Thanks.

From: Jim Growney
To: Brent Dather
Date: Thu, Feb 11, 1999 1:01 PM
Subject: Requested a recommended rumble strip design for PC concrete shoulders

Brent,

Mike Griffith sent me your message and asked me to give a shot at providing you a response to your request.

On the rumble strip site under Types is a summary listing of rumble strip dimensions for a selection of States. Formed strips in PC concrete are shown for CO, KY, MT, NY, SD, TN, UT and WY. Many of the installations for formed strips are on rather long center to center spacing (12 m to 20 m). However, MT and WY show a continuous formed strip and NY shows a spacing of 500 to 1000 mm intervals. It would be easy enough for any State to adjust their standard to provide for continuous or greatly reduced intervals for spacing. Generally all are formed with about a 25 mm depth and 50-60 mm longitudinal width (or 100-120 crest to crest). I am not aware of any efforts to deviate much from that depth and width dimension, except through milling. Also note from the site that a 1994 Virginia DOT (Chung S. Chen) study found milled rumble strips to be 7.2 times rougher than formed strips and to be 0.6 times louder. Also a Utah DOT (Eric Cheng, et. al.) study found the crash rate on roadways with discontinuous and offset formed rumble strip on concrete shoulders to be 16.9% higher than on continuous not offset rolled strips on asphalt shoulders.

For a recommendation, the milled strip, 100 mm by 400 mm, (while more costly) provides the greatest alert phenomenon to driver of large trucks or automobiles over rolled or formed rumble strips. Also continuous is better than the large gapped strips. Some shorter skip designs with milled (1500 to 2000 mm) are being used by a few States to provide a smooth crossover area for the bicycle traveler. Right now the continuous strip is the most widely used.

If you need more, let us know.

Jim Growney
Highway Safety Engineer
Eastern Resource Center

Brent,

On 2/10 you had asked about rumblestrip designs or practices for formed strips on PC concrete shoulders. In addition to the response we gave earlier, you may be interested in Carlos Libiran's, MI DOT, attached e-mail in which he describes how they have allowed the contractor to hand form a shape the same as would be produce by a milling machine. They have been satisfied with the results. Michigan standards are also attached.

We are always interest in your experiences in Arkansas. Take careJim Growney

16. Subject: Requested information on proposal to test rumble strips placed longitudinally along the center of the travel lane.

Submitted by (Jim_Douglas@dot.ca.gov) on Thursday, February 11, 1999 at 15:08:27

email: Jim_Douglas@dot.ca.gov

Name: Jim Douglas
Company: Caltrans
Street: 1120 N Street
City: Sacramento
State: CA
Zip: 95814
Phone: 916.653.2451

Question: I am curious and concerned about the proposal to test and possibly allow rumble strips to be placed in the center of a traveled lane. Could you provide me with additional information regarding the proposal, who is testing this, where, when, who to contact regarding it. etc?

Thanks

Jim

From: Jim Growney
To: hubsmtpt.hubsmtpt." Jim_Douglas@dot.ca.gov @
Date: Thu, Feb 11, 1999 4:32 PM
Subject: Requested information on proposal to test rumble strips placed longitudinally along the center of the travel lane.

Dear Mr. Jim Douglas,

Mike Griffith forwarded me your inquiry regarding the proposal to research the use of rumble strips in the center of travel lanes. This subject had come up with some commenters who had concerns about the use of rumble strips on the shoulder, affecting the traveled way of bicyclists. However, we had heard of the proposal to study the concept of center travel-lane rumble strips before our web site was operational. Mike Crow, Bureau Chief, Bureau of Traffic Engineering, indicated the Kansas DOT wanted to research the idea for possible use on low volume roads in rural areas which have no shoulders or shoulders too narrow for rumble strip installation. There are a number of issues and concern with this idea which the Kansas DOT is aware of . However, they intend to contract with one of their universities to further research the issue. At this time we have not learned of any other highway agency planning to study this type of installation.

You may find Mike Crow's address, telephone number and e-mail address on the Rumble Strip site in the Contact List under Ask the Expert.. Mike had indicated he was interested in hearing from any highway agency which may have studied or considered this treatment.

Thank you for your interest, We would also appreciate receiving the latest information or experiences from Caltrans on rumble strip issues which could be included on the web site for the benefit of others.

Jim Growney
Highway Safety Engineer
Eastern Resource Center

17. Subject: Requested information on increased spacing between the grooves of the milled rumble strip

Submitted by (dwillia3@mailgw.dot.state.tx.us) on Friday, February 12, 1999 at 09:28:11

email: dwillia3@mailgw.dot.state.tx.us

Name: David A Williams
Company: Texas Department of Transportation
Street: P. O. Box 1210
City: Atlanta
State: TX
Zip: 75551-1210
Phone: 903-799-1218
Fax: 903-799-1214

Question: Jim,

We have been using rolled-in shoulder texturing for a couple of years and now are looking at milled-in rumble strips for a rehabilitation project using concrete pavement (concrete shoulders) where traffic handling will not let us impression into the plastic concrete. Our standard for continuous milled depressions utilizes a 7" depression on 12" C-C spacings. We are wanting to increase the spacing of the milled depressions in the areas of side roads to still encourage the use of the shoulders for right turn lanes and acceleration lanes. Has anyone experimented with wider spacings of the depressions? What effect will it have if any on the "noise-print" of the rumble strips?

From: Jim Growney

To: hubsmtplib.hubsmtplib."dwillia3@mailgw.dot.state.tx.us@"

Date: Fri, Feb 12, 1999 4:03 PM

Subject: Requested information on increased spacing between the grooves of the milled rumble strip

Dear Mr. Williams,

You asked about experiences with wider spacing between the depressions for the milled-in rumble strips. You were considering using wider intervals near intersections to encourage vehicles to continue using the shoulder for right turn movements.

The milled rumble strip dimension of 180 mm (7-in) longitudinal width by 400 mm (16-in) transverse width with a 13 mm (0.5-in) depth on 300 mm (12-in) center to center spacing in a continuous array was first settled on by the States of PA and VA and now most other states as the "best" milled configuration to produce the desired vibration and sound levels to alert the drowsy or inattentive driver. A study by the Virginia DOT found that this milled configuration produces a 12.6 times greater vibration and 3.4 times higher sound level than the rolled in strip. It showed a 7.2 times greater vibration and a 0.6 time louder sound than the formed-in strip on PC concrete.

The State of FL specifies a skip array of 2100 mm of milled grooves with a 1500 mm of skipped pavement. However, the intent of this is to allow bicyclists a smoother opportunity to move to the left of the strip if need be. The State of CO has also recently installed a similar skip design. The dimensions of the milled section is still the same as that given above. Verbal reports from the FL experience indicate that the alert phenomenon for the skip design is at least as good as the continuous design. (State DOT contact names are on the web under Who's Who.) These are the only States at this time I am aware of using the skip design. The vast majority of States using milled-in strip use the continuous design.

In approaching a interchange for freeway installations many states discontinue the continuous shoulder rumble strip just before the deceleration lane and do not begin it until just after the end of the acceleration lane. This helps the driver avoid having to drive on the rumble strip should he or she need to travel on the shoulder during this maneuver. Also on non-access controlled highway the strips are also discontinued in advance of a right turn lane. The strip could be discontinued some distance in advance of an intersecting roadway to allow for use of the shoulder for the right turn movement.

If I find more information this, I'll let you know. Also if you have information and experience from the Texas DOT on rumble strip use you would like to share, please let us know.

Thanks for your interest.

Jim Growney, FHWA
Eastern Resource Center
Albany, NY

18. Subject: Requested more specific information on New York State Thruway run-off-road crash data.

>>> kob@cybertours.com 02/24 7:43 AM >>>

Thank you for your reply.

You write:

Between 1993 and 1995, the New York State Thruway Authority (NYSTA) installed milled shoulder rumble strips on nearly all of its freeways, about 3130 shoulder kilometers. While the NYSTA rate of total crashes remained steady at about 25 total crashes per 100 million vehicle kilometers traveled during the 1990's, the reductions in run-off-road crashes, injuries and fatalities between those for the year 1991 and the year 1996 were 74 %, 72 %, and 75 % respectively and between those for the year 1991 and the year 1997 were 88 %, 87 % and 95 % respectively. The NYS Department of Transportation has installed

milled strips on about 5070 shoulder kilometers of their freeways and expressways and report reductions of ROR crashes over the system of between 60 % and 70 %. There are many other reported examples.

A few questions:

1. Total NYSTA crashes you list 25/100mil-veh-kil. What was that number in 91' for run off road type accidents? Do you have that number for a few more pre-rumble years than just 91'.
2. When you write "run-off-road crashes, injuries and fatalities" I assume you mean "run-off-road crashes, run-off-road injuries and run-off-road fatalities". You have already said that the number for "total crashes" is basically 0%. What is that change number for total injuries and total fatalities?
3. What is number for total vehicle kilometers travelled for 91' 96' 97' NYSTA?

Thanks again, Ken

From: Jim Growney

To: hubsmtpt.hubsmtpt." kob@cybertours.com"

Date: Thu, Feb 25, 1999 5:45 PM

Subject: Requested more specific information on New York State Thruway run-off-road crash data.

Mr. O'Brien,

I have included a WordPerfect table in the attached e-file which contains information I believe to be responsive to your questions. If it does not download for you properly or you have other questions about this information, please let me know.

I wanted to let you know I appreciated reading your observations (discussion page and e-mail to Emmett) on bicycle travel under the shared road concept (which is the way most bicycle travel is done) and in its relationship to the presence of shoulder rumble strips. I have heard from Richard C. Moeur RCMoeur@aol.com (and visited his web site before that) who is active in traffic engineering and bicycle travel. You probably already know of him, but if not I encourage you to share your e-mail with him also. And yes, we are aware of Mr. John Forester's strong advocacy work for cycling transportation.

Your help in identifying ways and means to continue use of milled shoulder rumble strips as a highly effective safety treatment in reducing run-off-road crashes, fatalities and serious injuries, while still providing for the safe travel of all cyclists, is appreciated.

Selected Crash Experience on New York State Thruway

Year	VKT* (millions)	All Causes			Run-off-Road Causes**		
		Crashes	Injuries	Fatalities	Crashes	injuries	Fatalities
1991	10,900	2992	1196	35	557	358	17
1992	12,250	2968	1086	23	566	407	17
1993	12,500	3161	1265	21	558	328	8

Major portion of milled shoulder rumble strips installed on NYSTA during 1994 & 1995. All locations completed by this date.

1996	13,700	3426	1126	17	161	113	4
1997	14,000	3543	1022	18	74	54	1

* Vehicle Kilometers Traveled

** Causes identified on crash reports as due to alcohol involvement, driver inattention, driver inexperience, drugs (illegal), fell asleep, illness, passenger distraction, prescription medication, fatigue/drowsiness, glare.

Jim Growney

From: kob@cybertours.com

To: Growney, Jim <FHWA>
Date: Thu, Feb 25, 1999 9:49 PM
Subject: Re: Rumble strips Stat questions

Looks like I was able to get it into my MS Word 97 - if it was a table with 5 rows and 8 columns of data. Thank you, I will review.

Yes, thank you. Mr. Moeur is why I knew of your web site in the first place.

I would like to also bring to your attention a few more bike-specific web sites, that perhaps you could forward to your associates who are more directly involved in bike-specific issues:

<http://www.tiac.net/users/jsallen/bicycle/synthesi.htm#madison> and John Allen's other sites that can be reach through links from this page.

<http://danenet.wicip.org/bcp/dilemma.html> "The Dilemmas of Bicycle Planning", Paul Schimek, Massachusetts Institute of Technology - Department of Urban Studies and Planning.

Thank you again, Kenneth J. O'Brien

19. Subject: Requested CD-ROM, rumble strip dimensions and companies which install them.

>>>> a1a2a3@internet-zahav.net 02/26 12:52 PM >>>>

Dear sir,

I would like to get 3 copies of the CD about the rumblestrip. I can not find your location in the internet. pls.. let me know your www address.

Best regards,
Moshe Sheinfeld
Netivey-Hamifratz LTDa.l. Motzkin 24Tirat-HacarmelISRAEL30200

From: Jim Growney
To: hubsmtpt.hubsmtpt.@a1a2a3@internet-zahav.net
Date: Sat, Feb 27, 1999 9:19 PM
Subject: Requested CD-ROM,

Dear Mr. Moshe Sheinfeld and Mr. Netivey-Hamifratz,

The shoulder rumblestrip internet web site location is <http://www.ohs.fhwa.dot.gov/rumblestrips>. This site was begun on January 8, 1999 with information we had to that date. Since then the site has been revised and added to with other information which has come available. We also expect it to continue to grow and develop for a time. For this reason we have not yet developed a CD-ROM and we may not, at least until such time as we believe the influx of information has stabilize. However, if you visit the web site above, you should be able to find much information on shoulder rumble strips and the names of individuals to contact for more specific or local information.

Let me know if you still can not get on the web site.....Jim Growney, FHWA

>>> a1a2a3@internet-zahav.net 02/27 2:54 PM >>>

Dear sir,

Thank you for your answer. Pls. let me know where I can find the measurements of the rumble strips and company that apply it.

Best regards,

Moshe Sheinfeld.

From: Jim Growney
To: hubsmtpt.hubsmtpt."a1a2a3@internet-zahav.net"
Date: Mon, Mar 1, 1999 10:16 AM
Subject: Requested rumble strip dimensions and companies which install them.

Dear Mr. Moshe Sheinfeld,

The Federal Highway Administration does not endorse or advocate for any particular transportation/highway manufacturer, supplier or contractor. However, through the Internet web site on rumble strips you visited, we included, as a service, a listing of some contractors and installers of rumble strips which was provided by the American Traffic Safety Services Association. You may find this list at <http://www.ohs.fhwa.dot.gov/rumblestrips/> in the section titled Resources and then to Who's Who where you find Rumble Strip Providers.

We are also aware of the following manufactures of rumble strip milling equipment such as:

Wirtgen America Inc.
204 River Hills Drive
Nashville, Tenn., 37210; USA
voice (615) 391-0600
fax (615) 391-0791
<http://www.wirtgenamerica.com/tech8.html>

and

Surface Preparation Technologies, Inc.
81 Texaco Road
Mechanicsburg, PA 17055
Phone: 717/697-1450 FAX: 717/697-0813
<http://www.spt.addr.com/>

and

THOMAS GRINDING INC

P.O. Box 1083

1111 Riverside Dr.

Moore Haven, FL 33471-1083

Phone (941) 946-1461

FAX (941) 946-1448

<http://www.gate.net/~tgi/>

Dickson Industries Incorporated

P.O. Box 684

Tecumseh, Oklahoma 74873

Phone 405-598-6547

FAX 405-598-6549

The dimensions several States use for milled rumble strips may also be found on the web site under Knowledge and then Types. Click on Summary of Selected State Highway Agency Shoulder Rumble Strip Dimensions. There are a number of selected State's policies, drawings and standards also under types.

The common dimensions used for a milled rumble strip are 180 mm longitudinal width, 400 mm transverse width, 13 mm deep (curved groove formed with a milling drum of 300 mm radius); the grooves are spaced 300 mm center to center and generally placed 300 to 400 mm of the edge of the travel lane in the asphalt shoulder.

Jim Growney