

Survey Summary Results

Use of Shoulder Treatments to Reduce Run Off Road Crashes

In March 1998 the Federal Highway Administration's (FHWA) Office of Highway Safety conducted a survey to identify State policies and guidelines for textured shoulders. The FHWA noted that the American Association of State Highway and Transportation Officials (AASHTO) Strategic Highway Safety Plan called for States to "retrofit the rural interstate and other fatigue-prone facilities with shoulder rumble strips" over the next 3-4 years. Several studies have shown that textured shoulder treatments are effective in alerting drowsy or inattentive drivers who are prone to driving off the edge of the roadway. This rumble strip treatment is credited with reducing a significant number of run-off-road crashes in many States. Below are the survey questions posed in this survey and a summary listing of the results from the States which responded.

Survey Questions:

1. Does your State have a policy for the use of shoulder texture treatments such as rumble strips on new freeway pavements and/or overlays?
2. Does your State have a policy for the use of shoulder treatments on facilities other than freeways?
3. Does your State have a policy to provide shoulder texture treatments on facilities that are not undergoing pavement replacement, restoration, or overlays?
4. When using rumble strips or shoulder texture treatments does your State have a policy to accommodate bicycles?
5. Please provide unit cost data for shoulder treatments, by type.
6. Please provide any cost benefit data or studies on the effectiveness of shoulder treatments, by type.

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State	Point of Contact	Q1	Q2	Q3	Q4	Q5	Q6	Comments
Region 1								
CT	Robert Ramirez (860)659-6703 x3004	N/C1	N	N	N/C2	.42 .60 .63 .70 per lin m C3	none	<p>1 - Current practice is to install them on sections of freeways that have been resurfaced within the past 5 years and where the shoulder width is at least 915mm wide. (Policy attached to survey results)</p> <p>2 - Bicycles are not allowed on the class of roadways where ConnDOT is installing rumble strips.</p> <p>3 - The low bidder was awarded the project in all cases. Bid sheets attached to survey (\$0.42, .60, .63, and .70/lin</p>

									meter). Prices do not include M&PT and other misc. project costs. *** see material submitted by CT***
MA	Wesley C. Blount (617)494-2528	Y/C1	Y/ C1	Y/ C1	Y/C2	--	--	--	<p>1 - Rumble strips shall be installed along edge lines on all Interstate and NHS limited access roadways, and on other roadways with a speed limit of 65Km/H or greater, as they are resurfaced or reconstructed, with the following exceptions: (a) in areas where the breakdown (shoulder) lane is used as a travel lane during certain hours, rumble strips shall be installed along the median edge line only; (b) rumble strips shall not be installed on bridge decks; (c) for deceleration and/or acceleration lanes with no parallel paved shoulder, the rumble strip shall be terminated/initiated at the beginning of the deceleration lane or the end of the acceleration lane; (d) in any area where paved shoulder is less than 610mm in width.</p> <p>2 - Not used if shoulder is less than 610mm in width.</p>
ME	Tracey Praul (207)622-8350 x16	N/C1	N	N	N/C2	N/C3	50:1 C4		<p>1 - MDOT does not have an actual policy, but they do have a practice to install rumble strips routinely on all RURAL-4R projects on the Interstate. They are currently looking at also installing them on 3R Interstate projects, but have not yet begun to do so. They are not installed as part of regular maintenance activities nor are they installed as part of any other special programs. Maine uses a 400mm rumble strip, offset 100mm from the edge of the travel lane.</p> <p>2 - The rumble strip is only used on rural interstates, so bicycle traffic is not a consideration since bicycle traffic is not allowed on the interstates.</p>

								<p>3 - MDOT has not done any bid or other analysis on the costs of their rumble strips. Part of a MDOT sponsored research project was to look at benefit/cost ratio of the installation of rumble strips. The average was found to be 50:1.</p> <p>4 - MDOT does not have any information on the cheapest method. MDOT only allows milling, and it has only been done on asphalt shoulders.</p>
NH	Marty Calawa (603)225-1609	N	N	N/ C1	N/C2	.55 per lin m	--	<p>1 - All of the Interstate is being outfitted with rumble strips and this effort should be completed soon.</p> <p>2 - Rumble strips are not used on such routes.</p>
NJ	Dave Powell (609)637-4207	Y/ C1	Y/ C1	Y	N/ C2	.72 per lin m	none	<p>1 - Rumble strips shall be constructed on the inside shoulders that are 1.52m or greater and outside shoulders that are 2.44m or greater in width along the mainline on all interstate highways, freeways and other limited access highways. They may also be constructed along the land service highways at locations where: (1) accident data indicates a nighttime run-off-road accident problem; and (2) the shoulder approaching a bridge overpass or underpass is reduced or eliminated. The rumble strips should be provided a min. of 500' in advance of the bridge. The min. Length of rumble strips measured longitudinally along the shoulder shall be 30.5m for its effectiveness. Rumble strips shall not be constructed across the bridge decks and 30.5m in advance and beyond intersections and driveways.</p> <p>2 - Working on a policy.</p> <p>*** see material submitted by NJ***</p>

NY	Emmett McDevitt (518)431-4125 x231	Y/ C1	Y/ C2	Y/C3	Y/ C4	3.64-3.67 (‘93 and prior) .98-1.31 (‘94) .48 (‘95) .38 No M& PT (‘96) per m C5	500-600% r-o-r 70%	<p>1 - SAFE-STRIPS shall be installed on new, reconstructed and resurfaced shoulders of all rural full access-control highways (including rural full access-control parkways), regardless of accident history, on section of any highway with a history of pattern of inattention/sleep/fatigue drift-off road crashes.</p> <p>2 - SAFE-STRIPS should be considered for installation of new reconstructed and resurfaced shoulders of suburban/urban full access-control highway and rural partial access-control multi-lane highways (including suburban/urban full access-control and rural partial access-control multi-lane parkways).</p> <p>3 - On qualifying highways, SAFE-STRIPS should be installed either in conjunction with a construction project, or as a retrofit on existing shoulders via a separate contract exclusively for this purpose.</p> <p>4 - On highway designated as bicycle routes or having substantial volumes of bicycle traffic, SAFE-STRIPS should generally not be installed on the right shoulder, unless the shoulder is wide enough to accommodate the rumble strips and still provide a width of 3" (0.9m) for bicyclists. (Note: In this case the strips can act as a safety buffer zone between bicyclists and motorized vehicles.) Gaps in the SAFE-STRIP installation should be provided in advance of intersections where bicyclists are likely to make left turns, to permit bicyclists to merge with and cross traffic.</p> <p>5 - NY has info on costs of different methods. Also NYS Thruway or Institute of Traffic</p>
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								Safety Management and Research. NYSDOT's experience showed problems with "rolled-in" strips, including proper compaction of the asphalt in the shoulders and with rumble strips not providing adequate audibility. *** see material submitted by NY***
PR	Eddie Riveria (809)766-5600	N	N	N	N	na	na	
RI	Gabe Brazao (401)528-4551	N	N	N	N	na	na	
VT	Mark Richter (802)828-4433	N	N	N	N	na	na	
Region 3								
DE	David Nicol (302)734-1946	N	N	N	N	na	na	DeIDOT has developed a draft policy (with FHWA recommendation and assistance) on the use of shoulder rumble strips. The policy covers both new pavements and the installation of Aretrofit@ shoulder rumble strips as separate projects where paved shoulder exist but no resurfacing is planned. It covers both limited access highways and other highways, and has provisions for considering bicycles and horse-and-buggies. The draft policy has not yet been considered by DeIDOT's Policy Committee. DeIDOT is proceeding with plans to install shoulder rumble strips on I-95 this summer.
MD								

PA	Michael Castellono (717)221-4517	Y/ C1	Y/ C2	Y/C3	Y/C4	.36 LF (concrete) .15 LF (bituminous) 7/95-4/96	Y/ C5	<p>1 - Requires that milled shoulder rumble strips on each right and left shoulder be included on all limited access highway projects when shoulder resurfacing or reconstruction is included as part of the project.</p> <p>2 - Consider milled shoulder rumble strip installation on a project-by-project basis, for rural restoration (3R & reconstruction) projects where single vehicle run-off-the-road accidents are a defined problem and shoulder rumble strips will help reduce the problem.</p> <p>3 - Milled shoulder rumble strips do not have to be part of a construction or restoration project. They can be installed via projects initiated exclusively for this purpose.</p> <p>4 - It is important to take into account the needs of bicyclists, horse-and-buggies, etc., who utilize paved shoulders for travel: (1) it is desirable to have a minimum paved shoulder width of 8' when installing milled right shoulder rumble strips; (2) If it is desired to install milled right shoulder rumble strips on paved shoulders that are 6-8' wide, the review and approval of the Central Office of Pedestrian/Bicycle Coordinator is required to ensure that bicyclist needs are met. Do not mill shoulder rumble strips on right paved shoulders that are < 6' wide; (3) the designer has the flexibility (6-8' widths) to adjust the offset of the milled shoulder rumble strips to better adjust the special needs of bicyclists.</p> <p>5 - T.R. Record 1573 report by John Hickey, PA Turnpike Commission</p> <p><i>*** see material submitted by PA***</i></p>
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VA	Bob McCarty (804)281-5109	Y/C1	Y/C2	Y/C3	Y/C4	.125 LF	na	<p>1 - Rumble strips shall be placed on the shoulders of all new rural, limited access highways and on existing rural, limited access highways where shoulders are to be resurfaced or replaced. Rumble strips shall be cut into mainline shoulders to have a concave circular shape with a min. 13mm to 16mm max. depth at the center and have 175mm width across the cut. They shall be offset 150mm from the edge of pavement and be 400mm long and be spaced at 300mm centers. The depressed area of the rumble strip shall be coated with asphalt material CRS-1, 2, 1h or CSS-1h.</p> <p>2 - Rumble strips shall be placed on non-limited access shoulders where studies indicate there may be a significant number of run-off-the-road incidents. See C1 for standards and specifications.</p> <p>3 - Being done on a statewide basis at this time for those sections of Interstate where shoulders are in good shape and will not be replaced or overlaid in the near future. See C1 for standards and specifications.</p> <p>4 - Where bicycles are allowed, rumble strips will only be used where the min. width of paved outside shoulder is 2.4m or wider.</p>
WV	Ed Compton (304)558-2066	Y/C1	Y/C1	N	Y/C2	.10 LF C3	none	<p>1 - Policy and standards referenced are NOT attached</p> <p>2 - Rumble strips are not placed in narrow shoulders (such as truck climbing lanes or in the transitions from a full shoulder to a narrow bridge shoulder).</p> <p>3 - The only rumble strip utilized by WVDOH is Arolled in @ type.</p>
Region 4								

Survey Summary Results

<p>AL</p>	<p>Wes Elrod (334)223-7377</p>	<p>N/C1</p>	<p>Y/C2</p>	<p>N</p>	<p>Y/C3</p>	<p>Scoring .16/ SY + .58/ SY for pavement Surface Trmt. .60/ SY</p>	<p>none</p>	<p>1 - The ALDOT has an unwritten policy to allow the use of scored shoulders or surface treatment on new freeways or overlays. The treatment selected is determined by the State Division in a geographical area.</p> <p>2 - see Shoulder Treatment Guidelines (?)</p> <p>3 - Bicycles are not allowed on the Interstate. Shoulder pavements should be extended wider where there is potential for bicycle usage.</p> <p><i>*** see material submitted by AL***</i></p>
<p>FL</p>	<p>Bobby Norburn (850)942-9578 Jim Mills, FDOT (850)414-4318</p>	<p>Y/ C1</p>	<p>N</p>	<p>N</p>	<p>Y/C2</p>	<p>C3</p>	<p>none</p>	<p>1 - The safety of freeways and other limited access facilities on the State highway system is to be enhanced by the installation of shoulder warning devices in the form of rumble strips. Projects on limited access facilities shall include the construction of ground-in rumble strips.</p> <p>2 - Friction courses should be extended the full width of the shoulder on free access highways because of bicyclist usage. Terminating the friction course at the edge of travel lane or within the paved shoulder should be avoided to accommodate bicycles.</p> <p>3 - See FDOT Average Pay item Unit Cost Report.</p> <p><i>*** see material submitted by FL***</i></p>
<p>GA</p>								

Survey Summary Results

KY	Terry Chism (502)223-6750	Y/C1	Y/ C2	N	N/C3	Rumble strip bid is incidental to shoulder	none	<p>1 - (Bituminous indented) rumble strips will be used on all main line shoulders, including both outside and median shoulders (except for flush medians) on divided highways, and for two-lane roads when called for by the pavement design.</p> <p>2 - see material submitted by KY</p> <p>3 - While KY does not have a stated policy, we do provide room for bicycles on all identified bicycle routes.</p>
MS								
NC								
SC								
TN	Ron Carr (615)736-5361	Y/C1	Y/C1	N	N	Flex. Pvmt 257/mile Rigid pvmt 1068/mile (‘97)	none	<p>1 - A scored should shall be specified on all new construction and resurfacing projects on the Interstate System and the NHS. On multi-lane roadways scored shoulders will be used on all main line shoulders, including both outside and inside shoulders and median shoulders on divided highways.</p>
Region 5								
IL								
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Region 7								
IA								
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NE								
Region 8								
CO								
MT	Craig Genzlinger (406)441-1220	Y/ C1	Y/ C1	N	Y/C2	250 per km	none	<p>1 - Rumble strips shall be provided on the right and left shoulders of all Interstate new construction, reconstruction, and overlay projects unless there is a specific reason not to do so. On segments of the National Highway or Primary routes which are within designated city or urban limits, engineering judgement should be used on a case-by-case basis to determine if rumble strip installation is appropriate. Shoulder width ³1.2m-rumble strips will be provided on the shoulders of all National Highway and Primary new construction, reconstruction, and overly projects, subject to the restrictions within urban and city limits. Shoulder width < 1.2m-rumble strips shall generally not be provided on shoulders less than 1.2m wide.</p> <p>2 - Addressed in installation policy. Shoulder width < 1.2m-rumble strips: justification will be based in part on corridor continuity, approach density, bicycle usage, and accident history. Shoulder width < 1.2m-rumble strips: in cases where there is little or no bicycle use and the incidence of run-off-the-road accidents is high, rumble strips should be considered.</p> <p>*** see material submitted by MT***</p>

ND	Steve Busek (701)250-4348	Y/C1	N	N	N/C2	na cost is included in bid price for the pavement	none	<p>1 - Rumble strips are to be installed on the outside shoulder of Interstate construction and 3R paving projects. Rumble strips are not routinely provided on the median shoulder. Where practical, they are also installed on Interstate maintenance projects. When a concrete outside shoulder is used a 4' wide by 6' long cast in place rumble strip shape offset 3' from the edge of the travel lane and positioned on 60' centers is used. The rumble strip peaks are 12" centers and the max. depth is 1". When a bituminous outside shoulder is used, two options exist. The rolled in option is an 18" wide shape offset about 14" from the edge of the travel lane and rolled in continuously on an 8"-12" spacing with a nominal length of 2" and depth of 3/4". The milled in option is an 18" wide shape offset 6" from the edge of the travel lane. The shape has a nominal depth of 3/4" and length of 7" and is on 12" centers and is milled in continuously.</p> <p>2 - NDDOT designers do attempt to position the rumble strips to allow bicycles to stay out of the traffic lanes where possible.</p> <p>*** see material submitted by ND***</p>
SD	Roland Stenger Brett Hestdalen (605)224-7326	N/C1	N/C2	N/C3	N/C4	Included in the contract price for other bid items	na	<p>1 - SDDOT is in the process of developing a written policy on when rumble strips will be used. The draft policy indicates that rumble strips will be installed on both shoulder of the Interstate System and 4 land divided arterials when they are reconstructed or overlaid. For projects where the mainline is constructed out of concrete and the shoulders are asphalt the rumble strips on the outside shoulder will be installed in the outside 1.5' of the 26' wide</p>

								<p>concrete pavement. On the median side the rumble strips will be rolled into the asphalt shoulder. The SDDOT does make exceptions to this rule in urban areas where noise is a problem or in cases where the outside shoulder is being constructed wide enough that it can be turned in to an additional lane in the future.</p> <p>2 - On 2 lane asphalt highways with ADTs under 2500 rumble strips are not installed. If the ADT is over 2500 rumble strips are rolled into asphalt overlays and new mats. On 2 lane concrete highways with ADTs over 550 rumble strips will be installed in the outside 1.5' of the 28' wide mainline concrete pavement.</p> <p>3 - Rumble strips have not been installed into any highways that were not being reconstructed or overlaid.</p> <p>4 - By placing the rumble strip next to the edge line in concrete mainline pavements with asphalt shoulder the rumble strips provide a separation between the bicycles and vehicles. No special provisions for bicycles are made on highways with other surface types.</p> <p><i>*** see material submitted by SD***</i></p>
UT	Clair L. Hendrickson (801)963-0078 x238	Y/C1	Y/C1	N	N	na Included in cost to construct shoulders	na	<p>1 - See standard drawings. Note 460-1 contains a note that limits the use of shoulder scoring to rural highways with 80km/h or greater design speed. UDOT is in the process of adding a similar note to 450-1. This limits rumble strips to rural highways only.</p> <p><i>*** see material submitted by UT***</i></p>

WY	Lee Potter (307)772-2004 x46	N/C1	N	N/C1	N	rolled-in .01/ft milled-in .05/ft for item .19 contract cost	na	1 - WY does not have a written policy. They have in the past installed rolled-in rumble strips on asphalt shoulder as part of the pavement construction. In 1996, WY installed milled rumble strips as a retrofit project on various routes throughout the state on asphalt shoulders. Concrete pavements with concrete shoulders have had rumble strips included in the standard plans. Currently, however, WY placed a one year moratorium on the use of rumble strips mainly due to concerns of the bicycling community.
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Region 9

AZ	Phil Bleyl (602)379-3913	Y/C1	Y/C2	N/C3	Y/C4	.06 to .10 per LF	none	<p>1 - Provides for rolled in or formed rumble strips. The policy is currently being rewritten to provide for ground in rumble strips. The revised policy provides for 3 different widths of rumble strip 5, 8, and 12". The 12" width is to be used on divided roadways with a right shoulder of 6' or more in width and a left shoulder of 4' or more in width. The 8" are to be used on roadways where the shoulder is < 6'. The 5" will only be used in areas where the shoulder is < 4'. On roadways with minimal shoulders the 5" grind will be placed at the shoulder stripe. All ground in strips are on 12" centers.</p> <p>2 - The current policy provides for the treatment of shoulders on 2 lane, undivided roadways--placement of rumble strips on shoulders with widths > 6'.</p> <p>3 - The current policy is for rolled in strip placed during the paving phase while the asphaltic concrete can still be compacted. The policy does not provide for any other treatment. ADOT has experimented with the use of raised pavement markers and profiled thermoplastic pavement</p>
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								<p>markings applied to the edge line to provide a rumble effect.</p> <p>4 - The current policy is only applied where the shoulder is 6' wide or wider. This allows for sufficient room for the bicyclist to ride without riding in the travel lanes.</p>
CA	<p>Craig Copelan, Chief Traffic Safety Research Branch (916)654-4682</p> <p>Linus Motumah Traffic Safety Research Branch (916)654-2400</p>	Y/C1	Y/C1	Y/C1	Y/C2	.05 to .10 per foot	<p>49% run-off-road ('85)</p> <p>recent 33%</p>	<p>1 - See Caltrans Standard Plan and Specifications</p> <p>2 - Bicycle usage is a factor in considering shoulder rumble strips along state highways in CA. "Where bicycles are permitted, shoulder rumble strips should not be used unless approx. 1.5m of clear shoulder width for bicycle use is available between the rumble strips and the outer edge of the shoulder."</p> <p><i>*** see material submitted by CA***</i></p>
HI								
NV								
Region 10								
AK								
ID	<p>Cathy Satterfield (208)334-9180 x125</p>	N	N	N	N	--	--	
OR	<p>Victoria Kinne (503)399-5749</p>	N/C1	N	N	Y	680.90 per mile	na	<p>1 - Standard specification and a detail are available. ODOT does not really have a set policy for where and how rumble strips will be installed, it is something they are working on.</p>
WA								