

HOW TO BUILD A SAFETY EDGE

THE THREE-STEP PROCESS



ASPHALTPRO



Willow Designs' safety edge systems are built specific to your paver to maximize efficiency. According to the manufacturer, the systems can be removed or attached in 30 seconds or less even while the paver is in full production. Originally designed to fit the Pennsylvania DOT specification that devices must be able to adjust the angle of the safety edge, Willow's system also offers a vertical adjustment to help with applications on thick lift courses.

THE FEDERAL HIGHWAY ADMINISTRATION (FHWA) expects state departments of transportation (DOTs) in the United States to require new pavement construction and resurfacing projects to include a motorist safety feature. Gary Mittleman, CEO of Advant-Edge Paving Equipment, Albany, N.Y., reports that 12 states currently have road construction specs that require contractors to build a 30-degree safety edge as part of asphalt road paving projects. Allan Barilla, general manager of Morsky Construction Ltd., Regina, Saskatchewan, pointed out that contractors in his Canadian province haven't been allowed to leave a vertical edge on the outside shoulder of a highway for years.

Presenters including Chris Wagner of FHWA have discussed the topic of pavement edge safety and tools for creating a safe pavement edge at state and national asphalt pavement association meetings for some time now. For those unfamiliar with

the concept, the sloped pavement edge is designed to assist motorists who drive off the mainline of the road and make a quick correction to get back on. A vertical pavement edge offers a difficult climb for vehicle tires and often results in the motorist overcorrecting with the wheel, causing the vehicle to veer into oncoming traffic.

Wagner has made it clear time and again there is a correlation between drop-off height and danger; there is a correlation between edge shape and safety. If state DOTs specify a wedge or angle to a pavement's edge, safety increases. With the sloped pavement edge's popularity fixed, let's look at how to build it.

STEP 1. PREPARE THE SURFACE

Let's use a pavement preservation technique for our example. If ABC Paving wins the bid to mill and fill a 2-mile stretch of rural highway, the first step is to prepare

the surface. That starts with shoulder preparation. The vegetation, rutted mud, gravel, etc., that vertical pavement edges butt up against presents a challenge for a mere overlay.

While mowing alongside the road represents one type of roadside maintenance, you want to build something sturdier than a lawn for your shoulder. Brian Balster, Platte, S.D., can attest to that. When his daughter's car fell off a vertical pavement edge, good roadside maintenance saved the day. Even a firm shoulder can have ruts, though, and that's where the crew begins when the mainline has been milled and swept to perfection.

The crew wants to shovel away the vegetation, mulch up the dirt, grade the gravel and compact the loosened material into a solid subbase. That might mean bringing a haul truck out with riprap to level the shoulder with the pavement, but there's money under all that vegetation.



"Adjustability is crucial to build a safety edge that meets DOT specification not at the paver but after compaction of the pavement," said Jerod Willow, proprietor of Willow Designs. "We recommend that if you want a finish product safety edge at 30 degrees after compaction, the safety edge needs [to be] 22-25 degrees. Generally 5-8 degrees of 'stand up' will occur during compaction of the pavement."

Balster sells an attachment called the Retriever that's designed to do all the shoveling-and-mulching work in one pass while "retrieving" the aggregate alongside the road. The local agency saves money by retrieving what's already there instead of hauling in more.

Once the appropriate shoulder material is in place, the crew will compact it. OEMs and entrepreneurs have designed tools to make this step safer. Balster's mulching device that mounts to any 3-point hitch or grader nose plate switches out for the Retriever Compactor. It features a floating tongue scraper bar and hydraulic vibrator.

Another compacting attachment on the market now is the Berm Monster from KTL Fabrication. Keith Verhoff is the working mechanic who decided he'd seen enough tip-over roller accidents. The result is a device that can attach to your broom so you clean up millings and compact the shoulder at the same time.

STEP 2. PAVE

Assuming ABC Paving has created a fine milled surface and a sturdy shoulder, we'll move to the second step of building the sloped pavement edge, which is paving. As Morsky's Barilla shared with AsphaltPro readers, his crew started with an excellent substructure to lay the mat on.

From there, the Morsky crew worked with an attachment to the screed to create a sloped edge of the mat. In the "old days," they had no way to compact the sloped edge, so it was left uncompacted and with an open texture. Barilla visited with Bill Wright from Carlson Paving Products, Tacoma, Wash., and tried out the company's Vibratory Pavement Edger. While that product wasn't manufactured specifically for sloping off shoulder edges, it worked in that capacity and functioned as a heated mechanism that provided the same texture as the Morsky crew's main screed.

Of course OEMs and entrepreneurs haven't left this paving need unmet. Carlson now makes the Superior Safety Edge Bevel, which is a beveled end gate. Tom Travers of Carlson explained this device uses electric heat and angle of attack to obtain a heated, screeded, compacted and sealed sloped edge. Advant-Edge makes the Advant-Edger™. FHWA has tested that product and Advant-Edge's Ramp Champ and found them to meet government safety edge paving guidelines, according to Mittleman. "Specifically, they form a 30-degree edge at the shoulder of the road, they automatically follow changes in shoulder elevation and they are not a simple strike-off plate—their trowel surface produces a binding edge.

"The Ramp Champ comes with detachable shoes and the operator can change the slope of the tapered edge with it. In cases where the roller is "pushing" the edge out, the operator can flatten out the forming surface to achieve the desired end product."

TransTech Systems, Schenectady, N.Y., worked with FHWA to create the original shoulder wedge maker. Troxler Electronic Labs, ResearchTriangle Park, N.C., makes the Safe T Slope Edge Smoother, which is one of two that North Carolina DOT used in a demo project on Brogden Rd. in Johnston County. John Ball, proprietor of Top Quality Paving & Training, Manchester, N.H., prefers the device made by Willow Designs, East Berlin, Pa., but said the important factor for paving with any sloped edge shoe is not starving it of mix.

"I like the ones that attach to a front-mounted endgate, not the back-mounted ones," Ball said. "If you attach it to the back, look at where your material goes when you slide the end-gate out. And keep the end of the augers within 18 inches of the endgate so you can keep the edge device fed, which is what FHWA recommends."

According to FHWA's Wagner, the devices are all similar in price, hitting the \$3,500 to \$3,600 range for the hardware, although a quick Internet search will give you varied results. They require minimal additional material when paving because the hot or warm mix is merely being formed and densified by the foot instead of sloughing off unsupported. Each device offers a 25- to 35-degree angle of 5- to 6-inch wide shoulder. That works out great because FHWA currently recommends states require the angle be 30 degrees.

That brings up the issue of creating success. As Advant-Edge's Mittleman explained, it's not easy to get a high quality job out of a minimal overlay request. "When resurfacing a road with, say, a 1 1/2-inch overlay, it's difficult to form such a small high quality edge," Mittleman said. "We suggest that the operator extend the width of the road slightly so that the safety edge will transition from the new surface all the way down to the original shoulder or road bed. This will result in roughly a 4-inch drop-off that the safety edge is covering. It produces a stronger

edge and provides significantly greater safety for motorists."

Of course the edge is only safe if it's strong. These first two steps matter most when the contractor follows through with the third step—compaction.

STEP 3. COMPACT

Compacting the sloped pavement edge has not proved an easy step. Top Quality Paving's Ball said it's nearly impossible. He's seen crews using homemade attachments to rollers or endgates, but they often don't have the necessary lubrication system to keep the device from picking up material and ruining the edge.

Typically, the strikeoff is the only compaction the shoulder sees until the grader blade smooths the new topsoil on the sloped edge. Morsky's Barilla said the Carlson rep that met with his team back in the "old days" found fault with that right away.

KTL's Verhoff made the Berm Roller/Tamper with the water system necessary to avoid material pickup, but he said it's probably too heavy to attach to a breakdown roller. With the overall device weighing about a ton, he worried about the extension's offset causing undercompaction on the far side of the roller drum or even a mark in the mat on the sloped edge side. Verhoff said it might be a good test for attaching to the finish roller when the mainline mat is more forgiving.

No matter what type of device ABC Paving uses, the crew wants to achieve a consistent density along the edge so water doesn't get into the mat. There's no longitudinal joint to pinch, but there's a sloped edge to keep water and freeze-thaw effects from damaging. Tim Murphy of Murphy Pavement Technologies in Chicago pointed out that the contractors out West seal their pavements with a chip seal to protect edges from deterioration, but an extra preservation step might not be in every agency budget as the new safety measures go into place.

In the North Carolina demo project, two breakdown rollers were used where the contractor typically only used one. The report stated: "The paver was followed closely by two double steel drum breakdown rollers, Caterpillar CB 564D and Hypac C778B, operating in echelon. Both rollers were set for low amplitude with vibration at about 3700 RPM."

The demo's rolling pattern was as follows: "The two breakdown rollers operating together made three passes, without wandering across the lane, each roller covering one-half of the width of the lane with each pass. Generally, during each of the three passes...the Caterpillar roller overhung the outer edge 2 to 4 inches and the Hypac rolled over the centerline joint 2 to 4 inches. In some instances, the Caterpillar roller would make two passes overhanging the outer edge and the final pass either on the edge or a few inches away from the edge. The pneumatic roller then made up to 15 passes wandering across the lane, with 4 to 5 passes about 18 to 24 inches from the outer edge. The finish roller made two passes, one at the centerline joint and one right on the outer edge."

As readers can see, there's no mention of direct contact with the sloped edge. In good news, the DOT's report states that the "densities were higher and the air voids were lower adjacent to the edge in the test sections with the Safety Edge compared to the control section. The confining effect of the devices, which results in additional densification at the edge, is an added benefit of the Safety Edge and may increase the long-term performance of the edge."

The final step for ABC Paving is to come through with new material such as top soil—to provide shoulder backing for the roadside. Final grading leaves a level shoulder with a strong, safe edge beneath. View the figure on this page??? to see how all of these steps come together to form a safer roadway for the motoring public.

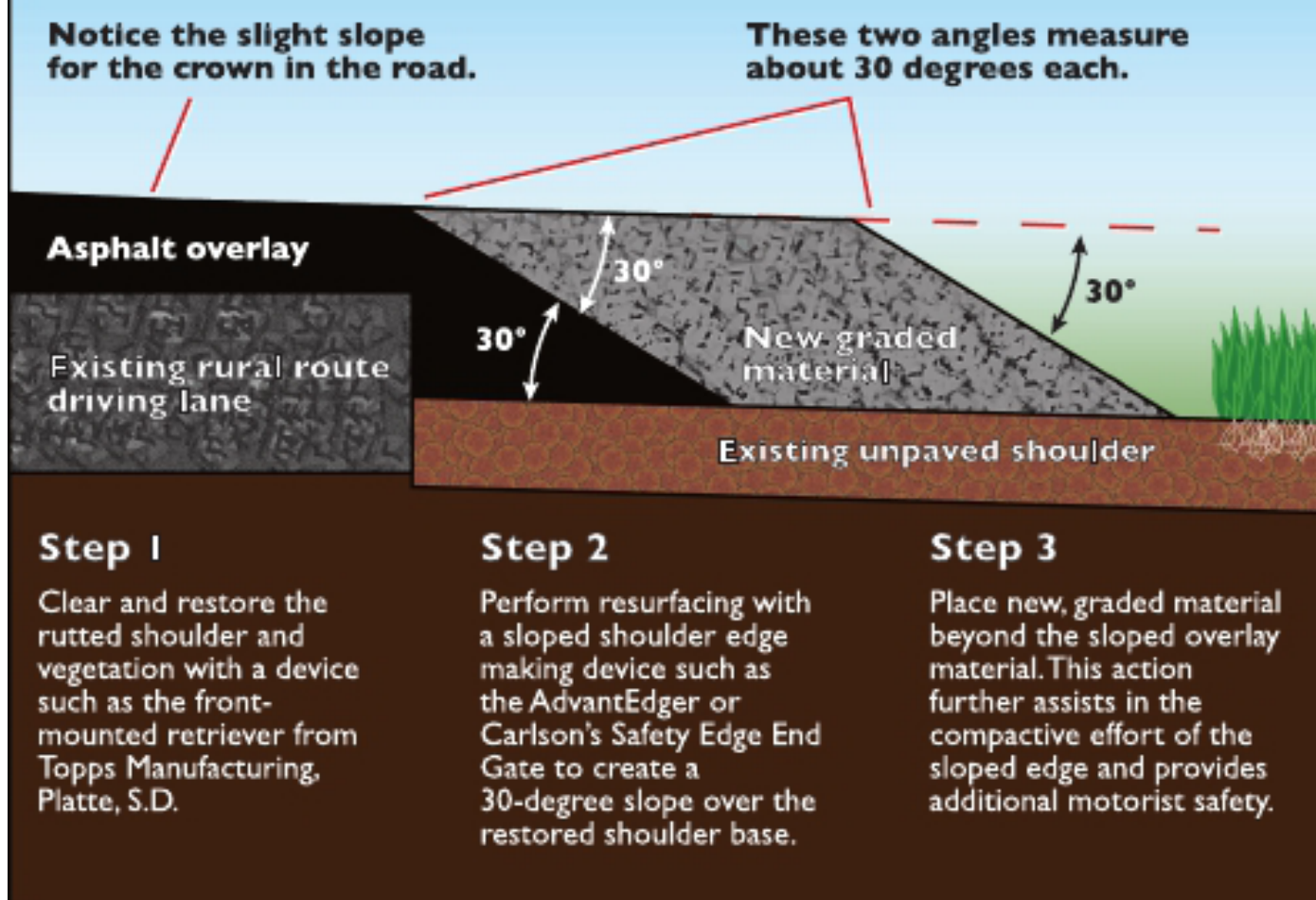


Thickness x Width x Formula = Yards per Mile³ x Cost per Yard = Value per Mile

1 inch x 36 x 1.3555 = 48.8³ x \$8 = \$390

_____ x _____ x 1.3555 = _____ x _____ = _____

Figure 1. How to Make a Safety Edge



Gary Mittleman of Advant-Edge Paving Equipment, Albany, New York, explained, "The road bed or shoulder base bed must be compacted and extend beyond the edge of the asphalt being applied. Paving a road and/or applying a safety edge over dirt, grass or any other non-compacted surface will lead to break-up and failure of the surface being constructed." The conclusions from the NCDOT report on the Brogden Road demonstration project in Johnston County stated, "The edge of the pavement separated from the mat at an isolated location where the edge of the pavement was placed over soft soil/vegetation. This would have occurred regardless of the Safety Edge; nevertheless, this underscores the importance of preparing the edge of the pavement."

With an attachment like the Berm Roller/Tamper, the broom operator can compact the shoulder while getting up the dust and bits left by the cold planer.

You can see the Troxler device affixed to the extended endgate in this image. Notice that the slope is being created within 18 inches of the end of the paver auger so the head of the material is feeding some distance to meet the edge. The crew has flooded the auger so the head of material is not uniform, but they're working hard to keep the mix feeding to the shoe.

To those of us used to seeing shiny objects photographed on gorgeous asphalt mats, the addition of a smart phone to the repertoire should be no surprise. The device isn't reading temperature or showing VMA; it's measuring the angle of this sloped edge at 31.2 degrees.

The crew from Morsky Construction Ltd. used the Vibratory Beveled Edger from Carlson Paving Products to construct a sloped edge and to compact it to keep moisture out. They won a Saskatchewan Heavy Construction Association innovation award for their use of it on their Highway 35 project.

When Brian Balster's daughter drove off a vertical pavement edge, he attributed her ability to walk away from the accident to the good base and lack of vegetation you see in the picture here. FHWA officials hope sloped pavement edges will prevent cars from veering as far as the tracks in this picture show her car did. Preventing off-road collisions and over-correction accidents is the goal.

The Retriever from Topps Manufacturing, Platte, S.D., mulches vegetation alongside a rural road and retrieves gravel to the shoulder surface and pavement edge.