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LHTAC

# Low Cost Safety Improvements for Rural Roads

## Reducing the Danger of Roadside Hazards

When it comes to dealing with roadside hazards, the best offense is a good defense. Knowing how to recognize deficiencies along roadways is a critical first step for selecting appropriate countermeasures.

***How the Numbers Stack Up***

About one in every three of all highway fatalities is the result of a single vehicle runoff-the road crash. Roadside quality is a key factor for improving safety on rural two-lane highways. Additionally, drivers may leave the roadway as a result of the following:

- driver error or inattention
- collision avoidance
- roadway condition
- vehicle component failure

***Human Factors***

Driver limitations contribute to accidents involving roadside hazards. Research such as the National Cooperative Highway Research Program's (NCHRP) Synthesis 321 "Roadway Safety Tools for Local Agencies" and "Synthesis of Highway Practice" indicate that, as a general rule, drivers are able to

- perceive two or more events per second
- make one to three decisions per second
- and take 30 to 120 actions per minute

***However, drivers also***

- commit at least one error every two minutes
- are involved in a hazardous situation every two hours
- have one or two near collisions per month, and
- average one crash every six years.

## STEPS YOU CAN TAKE TO REDUCE ROADSIDE HAZARDS

### 1. Tree Removal and Restriction

Seventy-seven percent of fatal tree crashes occur on rural roads. According to the Transportation Research Board (TRB) NCHRP Report 440, there is a measurable reduction in accidents on congested rural two-lane highways as trees are cleared or relocated further from the roadway. Accidents involving trees can be reduced by as much as 22 percent by increasing their distance from the roadway by as little as three feet. By increasing the tree obstacle distance to 13 feet on rural two-lane highways, fatalities are further reduced by a whopping 66 percent and non-fatal accidents by 20 percent.

## 2. Relocation of Utility Poles

Utility poles that are close to the edge of the pavement can be serious roadside hazards. By increasing the offset distance, tangible reductions in both fatal and non-life threatening injury accidents can be reduced. There is a direct correlation between the distance a pole is relocated from the roadway and the expected percent reduction in utility ole crashes. Increasing the pole offset from four feet to 15 feet can reduce crashes involving utility poles by 73 percent

## 3. Breakaway Sign Supports and Street Light Poles

Another potential set of roadside hazards that agencies can address are sign supports and light poles. It is critical that supports and poles are offset an adequate distance from the roadway and that they are constructed of breakaway materials. In determining adequate offset distance, it is important to note that curb and gutter do not change clear zone requirements. Clearing or relocating sign supports and street light poles produces considerable reductions in obstacle accidents as well. For example, an increase in the offset distance from the roadway of three to 10 feet produces 14 to 40 percent reductions in accidents respectively. When the situation is such that relocation is not feasible, NCHRP 500, Volume 6, Strategy 15.1 B3 advises that highway agencies delineate these hazards with markers or retroreflective tape.

## 4. Mail Boxes

It is important that agencies work with the public to remove dangerous mail box configurations from roadsides. Mail boxes embedded in cement blocks or mounted on supports not intended for that application (i.e. a hardened steel pipe) can pose a serious roadside hazard. Mail boxes should be mounted on approved breakaway supports.

## 5. Outdated Roadside Hardware

As agencies inventory potential roadside hazards, antiquated guardrails and terminals should be targeted for replacement. An outdated BCT Terminal End is a serious risk to drivers. By replacing it with a NCHRP 350 compliant end terminal the damage a vehicle and driver might sustain can be mitigated substantially.

## 6. Drop-offs and Non-Recoverable Slopes

Properly addressing sudden drop-offs, power poles in the toe of ditches, and non-recoverable slopes can prevent accidents from occurring and reduce property damage and injuries. For example, conditioning a roadside from a slope of 2:1 to a slope of 4:1 can reduce single-vehicle crashes and total crashes due to side-slope by 10 percent. Taking that 2:1 slope to 6:1 can more than double that benefit to 21 percent as you come closer to a traversable slope.

## 7. Supplemental Pavement Markings

Rumble strips are an effective countermeasure to reduce the number of vehicles leaving the roadway. As a supplement to pavement markings, they provide a drowsy, inattentive, or distracted driver with a clear warning that the vehicle has left its travel lane. This will in turn allow some reaction time before the vehicle leaves the road. It has been shown that adding rumble strips to a two-lane road can reduce accidents by 49 percent as opposed to the 20 percent reduction seen with pavement markings alone.

## 8. Rumble Strip v. Rumble Stripe

Just as important as picking the right tool for the right job is choosing the best rumble application for the right circumstance. Rumble strips are effective supplements to pavement markings, but can pose a hazard for bicyclists. When working with rural two-lane roads with limited width, bare in mind that center-line rumble strips are not effective countermeasures.

Rumble stripes are a relatively new pavement marking innovation. Mississippi has evaluated several different sized rumble strips and striping patterns. They experimented with six inch, nine inch, 12 inch, and the standard 16 inch rumble strips by installing them with the edge stripe located in the rumble strip. They found that edge rumble stripes have the effect of moving vehicles over closer to the center-line. Michigan has experimented with the edge-line painted over the shoulder rumble strip, making comparisons between the visibility of this combined marking with that of a normal painted edge-line alone. They found that having the rumble with the painted edge-line increased marking visibility for motorists.

## 9. Safety Edges

Many highway agencies leave an “abrupt” edge when resurfacing. NCHRP 500, Volume 6, Strategy 15.1 A8 prescribes the application of a shoulder treatment to reduce the number of accidents due to vehicles leaving the roadway. A well designed safety edge helps errant vehicles maintain stability, particularly on roadway re-entry.

An edge drop-off greater than three inches can create significant problems for a driver venturing too close to the edge of the roadway. Adjusting the edge of the pavement to a slope of 45 degrees or flatter, provides drivers with a better chance of correcting a driving error without leaving the roadway or over correcting.

## 10. Pavement Edge Rutting

Be aware of hazards posed by pavement edge rutting as well. Edge rutting occurs on all sections of roads, although it is usually a small percentage of road length. It is more common in curves, near turning movements, and near mailboxes. The application of a safety edge can correct pavement edge rutting before it leads to an accident.

It is important that highway agencies pay close attention to roadway edges. Abrupt edges and edge rutting have been the basis of many Board of Claims lawsuits. Applying a safety edge and maintaining shoulders to the pavement edge can reduce tort liability during construction and after project completion.

To sum it up, as agencies consider ways to reduce roadside hazards, remember “Move it, shield it, mark it!” It may not always be possible to relocate, replace or correct every potential hazard on the roadway. Move what you can, shield what you’re able and provide visible and effective markings.

An unsafe pavement edge

An inexpensive way to assure safe pavement edges is to specify a 30 degree to 35 degree angle asphalt fillet "Safety Edge" on all road construction and resurfacing.

*Reference: The Link, Summer 2008, Kentucky LTAP*