



## DEPARTMENTAL INFORMATION EXCHANGE

# COST-EFFECTIVE SAFETY IMPROVEMENTS FOR LOW VOLUME RURAL ROADS

## PROBLEM STATEMENT

Environmental factors that affect highway safety are well known, and policies have been established to address them. Nevertheless, many rural low volume roads carrying fewer than 1,000 vehicles per day do not meet traffic safety standards. While it's unlikely that there will ever be enough funds to bring all deficient low volume roads into compliance, it is possible to enhance their safety within the available funds. To do so, strategies must be developed that rationally allocate limited safety construction and maintenance funds. While these strategies may not be the standard approach, they often present a low-cost means of saving lives and reducing injuries on these rural roads.

## OBJECTIVES

The Texas Transportation Institute (TTI) conducted study 1130, *Safety Improvements for Low Volume Rural Roads*, in cooperation with the Texas Department of Transportation (TxDOT) and the Federal Highway Administration (FHWA) to formulate a strategy that would optimize safety on low volume rural roads within the available funds. Rejecting a conventional wisdom of "do all or do nothing," the researchers approached the challenge from a "doing something is better than doing nothing at all" premise. They developed a "Low-Cost Safety Improvement" strategy. They also developed a prioritization rationale called "Process Remediation" which recognizes that *process* rather than *location* should drive safety operation and design improvement decisions on low volume roads.

## FINDINGS

Major safety improvements to low volume rural roads are relatively uncommon; to address the safety of low volume roads in this country, the following facts must be recognized.

- The funds society is willing to spend on highway safety are limited.
- Low volume rural roads constitute a huge physical plant.
- The number of people killed/injured on low volume rural roads is relatively small when compared to other highways.
- Given the above facts, safety upgrades on low volume rural roads must be low-cost investments if they are to be cost-effective.
- Numerous *low-cost* improvements to deficiencies throughout the low volume rural highway system will save more lives and reduce more injuries than a few "*up-to-standard*" improvements.
- Because it is difficult to identify "high accident sites" on rural roads, improvements will be more efficient if carried out on a "problem-specific" basis, rather than a "site-specific" basis.



Texas  
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## Research Summary Report

D-10 Research • P.O. Box 5051  
Austin, Texas • 78763-5051

## Process-Based Problem

### Identification

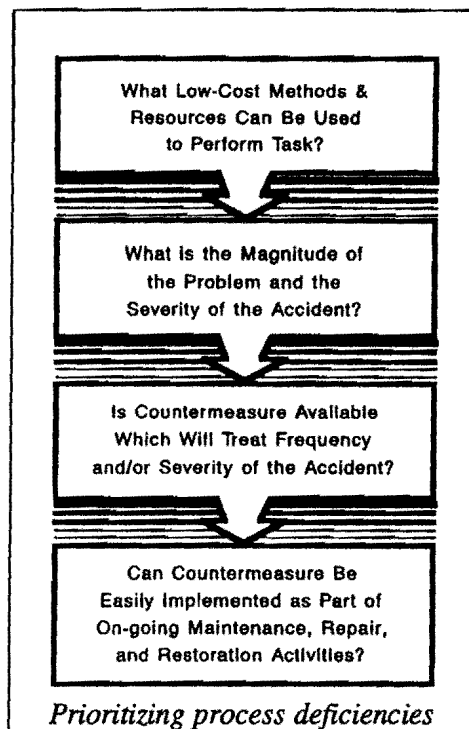
This study advocates process based improvements (as opposed to remediation based on high accident locations), and low-cost safety improvements. Instead of determining *where* accidents are occurring on low volume rural roads, the study asks: "Why and how are people being killed and injured on low volume rural roads?" "By what processes are they becoming involved in accidents?" "Are vehicles running off bridges, overturning on roadsides, or striking objects?" "What objects are vehicles striking?"

To prioritize process deficiencies, the remedial method to correct the particular element must be determined. First, available resources must be surveyed, bearing in mind that only low-cost methods will be cost-effective on low volume rural roads. Secondly, the magnitude of the problem and the severity of the accident must be weighed. Once the problem is classified, before action can be taken, a countermeasure must be available or developed. And fourthly, if the countermeasure is to be implemented, it must be incorporated in the routine maintenance, repair, and restoration activities.

### Low -Cost Safety Improvements

To demonstrate the basic concept of Low-Cost Safety Improvements (LCSI), the researchers offer cost-effective modifications (versus more costly replacement) to the following roadside appurtenances and retrofits :

**Concrete Culvert Headwalls.** Many old-style culvert headwalls can be made safer simply by breaking them off at ground level. A combination of breaking off the posts and rail above the ground beam and raising the shoulder up to the ground beam level could also improve safety.



### **Concrete Bridge Rail and Parapet.**

A short, low variety of a lightweight, fragmenting perlite concrete crash cushion, such as the Advanced Dynamic Impact Extension Module (ADIEM), would increase safety at sites with these rails.

### **Guardrail/Bridge Rail Transition.**

Old-style versions can be modified with reflectorized delineator plates and fragmenting perlite concrete blocks to improve safety at a modest cost.

**Guardrail Removal.** Many short segments of guardrail have no value and are a formidable "spearing" hazard. By removing the rail, using the posts for supporting delineators, and converting the culvert end with E-shaped reinforced concrete, a portion of the roadside will be relatively safe.

**Side Road Culverts.** Circular culverts at property entrances can be rendered much safer if E-shaped, pre-cast concrete forms are installed.

None of the above improvements would be to new-construction stan-

dards, but any one of them could significantly improve the safety for drivers leaving the road and hitting a fixed object.

## CONCLUSIONS

The study findings support a combination of "process based problem identification" and "low-cost safety improvements" to rectify many long-term deficiencies on low volume rural roads. If we can isolate the processes by which accidents are occurring on these roads and devise treatments to thwart these processes, then we can increase the net safety of low-volume rural roads. Assessing costs and availability based on district materials, equipment, and labor requirements should result in some fairly obvious choices about which tasks to accomplish first. To maximize task efficiency with a savings in equipment, commitment, and labor skills, districts should undertake a single process at a time. With experience, easier ways of producing the same improvement will result, and efficiency should increase as the work on a particular area progresses.

--Prepared by Susan Lancaster, Communications Manager, and Sandra Parsons, Research Associate, Texas Transportation Institute.

The information described in this summary is contained in TTI Research Report 1130-2F, "Safety Improvements for Low Volume Rural Roads," Don L. Ivey and Lindsay I. Griffin III, revised February 1992. The contents of the summary do not necessarily reflect the official views or policies of the FHWA or TxDOT.

