

# Lone Star Roads™

Local Technical Assistance Program • Texas Engineering Extension Service • Sponsored by the Texas Department of Transportation and the Federal Highway Administration

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## Management Tools for Gravel Roads

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Traditionally, gravel road maintenance is scheduled after a quick visual inspection of the roadway's surface condition, or more commonly, in response to complaints from road users. Sometimes local supervisors know of road sections that will need attention after significant rain events. However, in many areas of Texas more sophisticated methods may be in order, because the need for road maintenance is expanding. As the state grows, Texans are increasingly opting for a rural lifestyle, resulting in new traffic demands. In addition, increases in heavy trucks and other traffic, due to rapid expansion of oil and gas production, present major challenges for local areas. The use of good management tools may hold promise for better meeting these challenges, especially in the face of severe budget limitations.

The Minnesota Department of Transportation (MnDOT) has taken a big step toward helping local agencies meet the road maintenance challenge. In a recent Transportation Research Synthesis, commissioned by the Minnesota Local Road Research Board, cities and counties across the nation were surveyed to learn about use of tools for managing gravel road maintenance. Not surprisingly, few jurisdictions use such a road management tool. However, most recognize the value that such a system may have for developing management plans. From those using an information management tool, the following was learned:

### Primary reasons for use were to:

- Manage costs/budgets
- Track conditions of roads
- Guidance for scheduling maintenance
- Information helpful in prioritizing routes

### Useful data collected:

- Materials cost
- Manpower and Equipment cost
- Construction History



Gravel road with good crown



Gravel road without crown; poor edge maintenance

### Benefits Of Maintenance Management

Taking an organized approach to road management has multiple benefits. By documenting the actual conditions of roads, agencies can: set realistic budgets; make timely repairs; implement more cost-effective procedures; and plan for future needs. With more detailed information, local officials can better respond to questions from the public, because explanations become easier and tend to receive greater public support.

Creating an operating plan for gravel road management and organizing to function accordingly, takes time and effort. However, as traffic demands continue to increase and local agencies struggle to maintain their roads, management tools will become increasingly important. These can allow an agency to successfully schedule and correct roadway deficiencies in a proactive manner instead of simply reacting to situations with repeated "just enough" maintenance.

Regardless of the type of information tool used, good results will depend on the three steps: 1) initial inventory of roadway conditions; 2) evaluation and rating of road segments; and 3) setting of priorities.

### Initial Inventory

Initially, officials must inventory their roads. Since any one road can have varying conditions along its length, roads must be divided into inventory segments having similar characteristics. Segments can be based on general traffic demand, right-of-way width, or any other criteria specific to the road's character and use. During this inventory, information such as construction history, roadway width, and major drainage features is collected.

### Gravel Road Evaluation and Rating

Experience informs us that the condition of a gravel road can change, literally overnight. Heavy rains followed by local traffic can change surface characteristics from one day to the next. However, knowledgeable motor grader work can significantly improve the surface. For this reason, surface condition evaluations should not be the primary evaluation criteria.

## Lone Star Roads

The Local Technical Assistance Program (LTAP) is a nationwide effort financed by the Federal Highway Administration and individual state departments of transportation. Its purpose is to translate into understandable terms the best available technology for roadways, bridges, bicycle and pedestrian facilities, and public transportation for city and county roadway and transportation personnel.

The Lone Star LTAP center, operated by the Texas A&M Engineering Extension Service, is sponsored by the Texas Department of Transportation (TxDOT) and the Federal Highway Administration. This newsletter is designed to keep you informed about new publications, techniques, and training opportunities that may be helpful to you and your community.

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It is helpful to separate the various features common to gravel roads. Criteria for the four road features listed below can be used to evaluate and rate road segments as to their need for maintenance:

- Crown
- Drainage
- Adequacy of gravel layer
- Surface defects

Based on these four major features, the Transportation Information Center of the University of Wisconsin-Madison has developed a publication to help agencies evaluate and score gravel roads. This document is found at <http://tic.egr.wisc.edu/Publications.Iasso>. The accompanying RATING TABLE is from this online document.



Gravel road with limited crown, but good aggregate mix

Surface Rating	Visible Distress	General Conditions/Treatment Measures
<b>5</b> Excellent	No distress; Dust controlled; Excellent surface condition and ride.	New construction – or total reconstruction. Excellent drainage. Little or no maintenance needed.
<b>4</b> Good	Dust under dry conditions; Moderate loose aggregate (gravel) Slight wash-boarding	Recently regraded. Good crown and drainage throughout. Routine grading and dust control may be needed.
<b>3</b> Fair	Good crown (3" – 6"). Adequate ditches on more than 50% of roadway. Gravel layer mostly adequate but additional aggregate may be needed in some locations to correct wash-boarding (1' – 2" deep) over 10% - 25% of the area. Moderate dust, partial obstruction of vision. None or slight rutting (less than 1" deep). An occasional small pothole (less than 2" deep). Some loose aggregate (2" deep).	Shows traffic effects. Re-grading (re-working) necessary to maintain. Needs some ditch improvement and culvert maintenance. Some areas may need additional gravel.
<b>2</b> Poor	Little or no roadway crown (less than 3"). Adequate ditches on less than 50% of roadway. Portions of the ditches may be filled, over grown and/or show erosion. Some areas (25%) with little or no aggregate. Culverts partially full of debris. Moderate to severe wash-boarding (over 3" deep) over 25% of area. Moderate rutting (1" – 3"), over 10% to 25% of the area. Severe loose aggregate (over 4").	Travel at slow speed (less than 25 mph) is required. Needs additional new aggregate. Major ditch construction and culvert maintenance also required.
<b>1</b> Failed	No roadway crown or road is bowl shaped with extensive ponding. Little if any ditching. Filled or damaged culverts. Severe rutting (over 3" deep), over 25% of area. Severe potholes (over 4" deep), over 25% of area. Many areas (over 25%) with little or no aggregate.	Travel is difficult and road may be closed at times. Needs complete rebuilding and/or new culverts.

gradation and hardness of the gravel is very important, but is often overlooked, especially when using pit run gravel. A good gradation contains a mixture of larger aggregate (approximately 1 inch), sand-sized aggregate, and fines. More fines are recommended for a surface layer than what is normally used in base mixtures. The right mix of fines helps keep the larger aggregate in place, minimizing the tendency for it to be pushed to road edges. Good gradation also helps reduce dust. However, during prolonged dry conditions, dust is difficult to completely prevent. Unfortunately, dusty conditions actually reduce the fines in the composition of the road surface layer. Therefore, it is essential to replace the fines in the mix. Fines can often be reclaimed from road edges and mixed with the existing gravel when regrading the road.

**Surface Defects** Surface defects are commonly referred to as washboarding, potholes, or rutting. Usually, these deformations can be repaired by motor grader work. However, if these conditions quickly return, the road should be re-evaluated to see if criteria for crown, drainage, and surface composition are being met.

**Setting Priorities**

After roads have been inventoried, evaluated, and rated,

the next step is setting priorities. By using rating criteria and the local importance of each road, an agency can assign priorities and schedule maintenance work accordingly. By capturing true maintenance cost, realistic budgets can be developed for maintenance work based on prioritized needs. Since not all improvements can be made in one year, a multi-year budget can be established. Several survey responders would like to use such a plan to determine when it is economically prudent to pave or seal-coat a gravel road to avoid excessive ongoing maintenance costs, recognizing that not all roads equally warrant such an investment.

**Getting Started**

As a part of the Minnesota synthesis, commercially available software used by some respondents was summarized in the synthesis report found at <http://www.dot.state.mn.us/research/TRS/2014/TRS1407.pdf>. Also, the rating system by the University of Wisconsin-Madison (cited above) offers an example that could be used to jump-start inventory work on your road system. ★

**Crown** A gravel road must be built so water drains quickly off the surface. If it is not, water softens the surface and quickly deteriorates the roadway's structural strength. Building a crown into the road makes its center higher than the edges by 4 to 6 inches. Maintaining this crown is the first key to sustaining a durable roadway.

**Drainage** Road edges must be maintained so that water leaves the road on its way to side ditches. Roadside ditches and culverts must be able to handle surface water that drains from the roadway and adjacent lands. These tend to fill with debris and silt resulting in standing water and flooded roads, so good ditch-cleaning practices can dramatically reduce the need for extensive repair or reconstruction of roads. As cumbersome and costly as this can be, it can be more costly if ignored.

**Adequacy of Gravel Layer** Heavy vehicles require an adequate layer of gravel having the right characteristics in order to distribute the loads to the subsoil below. A minimum layer of 6 inches is normally required. Thicker layers (up to 10 inches or more) are sometimes needed for roads used by frequent, heavy loads. The



## Lone Star Local Technical Assistance Program

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# Lone Star Answers



**Question:** The Texas Manual on Uniform Traffic Control Devices (TMUTCD) establishes retroreflectivity standards for traffic and street signs, so when must ours meet these requirements, and who will check our compliance?

**Answer:** First, no federal or state agency has responsibility to check a jurisdiction's signs. It is the responsibility of the jurisdiction.

Provisions of the TMUTCD apply to all public roads in Texas, and it is issued by TxDOT. However, TxDOT has no enforcement role except on TxDOT-maintained highways. If questions about signs are part of a lawsuit, the courts become the enforcement mechanism.

Second, there is no specific date when all signs or any one sign must be in compliance, but there are requirements to consider. Your first objective is to keep your roads as safe as you can, but it is also important to limit agency liability. The TMUTCD emphasizes regulatory and warning signs. What is required is that you have a management method in place for monitoring sign retroreflectivity and replacing signs if they do not meet standards. The specified date to have a system in place has passed (June 14, 2014). To be sure you have a management method in use, ask yourself the following questions:

- Do we know where all our regulatory and warning signs are located?
- How often do we check on their retroreflectivity characteristics?
- How do we determine that signs need to be replaced?
- Does our procedure assure that all our signs are periodically checked?
- Is our procedure clearly documented?
- Are we keeping records of when signs are replaced?



*Remember, the Lone Star LTAP Center is here to help when you need answers about road maintenance, drainage issues, or traffic safety. Just give us a call toll free at 1-800-723-3811 FAX to 979/458-1426 ITS1@teex.tamu.edu.*